TELEPHONE ENGINEER

Volume XVII CHICAGO, FEBRUARY, 1917

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AUTOMATIC [illegible]

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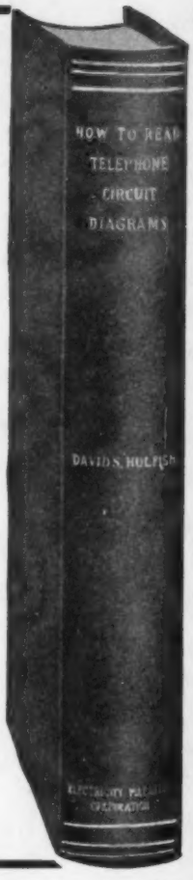

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VOL. XVII CHICAGO, FEBRUARY, 1917 NO. 2

The Central Union Decision

THE decision handed down by Judge Dever in the Central Union case, which is abstracted at some length in this issue, fills a printed book of one hundred and sixty-two pages seven by ten inches. The suit of the minority stockholders, as related in the abstract, was started four years ago this month and accumulated a record of some thirty thousand pages. It is probably the most important of the Bell suits, not even excepting the famous Dunbar case of eight years ago, when the courts declared null and void the attempted purchase of Kellogg stock by the Bell. The Dunbar decision was printed in TELEPHONE ENGINEER in March, 1909, and is cited in the present decision.

Pending appeal to the higher court the Central Union is Independent (or at least independent) because the Bell holds no interest in it. The Independent field naturally takes keen delight in any event that is adverse to Bell interests; but it is obvious that mere Bell discomfiture, without Independent advantage, signifies nothing. The fact that Central Union is certified as an independent company is an Independent gain only if Central Union proceeds to buy of Independent manufacturers—or in the open market—and co-operates with other Independents as those operators now co-operate with each other.

Central Union buying in the open market is a natural sequence of the court order. Co-operation with the Independent operators is beyond court jurisdiction, and for that reason improbable. The informal influence of the Bell over the Central Union will continue. The formal and official influence is broken.

But there is other Independent advantage in the decision, outside the specific relations of the company affected. The legal status of monopoly and competition is clearly defined in a manner that should act to restore the confidence of those Independent operators who have, of late, manifested some doubts on the subject.

The court, in its summary, concludes that the stock control of the A. T. & T. in the Central Union is illegal and void because "its inevitable tendency is to suppress competition and to create a monopoly"; and because "the stock of the Union Company was acquired by the parent company for the purpose of suppressing competition and of creating a monopoly."

Unequivocally, therefore, the Superior Court of Cook County has held that the suppression of competition in the telephone field is illegal.

That opinion we regard as the kernel of the decision, from the viewpoint of the telephone industry. Whatever the final disposition of the case, the holding on competition stands.

The law of the state of Illinois on the suppression of competition has been made perfectly clear. In it there are no exceptions in favor of public utilities or "natural monopolies," nor any recognition that such a thing as a natural monopoly exists outside the imagination of a corporation promoter.

Independent telephone operators in recent years have shown the influence of constant Bell pressure in their growing suspicions of competitive economics and their growing tolerance of monopoly. Some of them, we regret to say, have even subscribed passively to the

monopolistic theory of public service, and have lost sight of the truth that competition must always prevail.

Judge Dever's opinion is interesting just as a bit of telephone history; but its importance lies in the firm support it gives to the wavering defenses of competition, and in its condemnation of monopolistic practices.

The Way to Raise Rates

DISCUSSION is often heard as to the "advisability" of raising rates. The word, considerate as it may be of everyone's feelings, is hardly the proper one to use in this connection.

Speaking in the broadest possible sense, and disregarding a host of complications in order to lay down the simplest rule, a telephone company's rates should pay a profit that will make the company's securities worth par. In dividends this may mean five per cent or it may mean twelve per cent. There is no way to establish a definite percentage return as standard, and declare that no company shall earn more or should earn less than that figure.

The stock of some companies pay eight per cent and is quoted at a hundred and thirty. That means the investing public has decided that about six per cent is adequate return for the investment.

The stock of some other companies pays six per cent and is quoted at seventy-five. That signifies the public's opinion that that specific investment must pay eight per cent.

And the investing public always decides what the rate shall be. Legislation and commission rulings have little to do with it. Those official influences may decide what percentage of par is just and proper; but they cannot make the investors buy at par if the proposition is not worth it, nor prevent the bidding of more than par if it is worth it.

We are not concerned with rates that are too high. There are not enough cases of that kind to be concerned about, and there are plenty of regulating influences to take care of them. For our purposes, the rates of telephone companies are either too low or just right. Those whose income is just right are to be congratulated. Those whose rates are too low have got to raise them or quit.

We don't necessarily mean quit now. A corporation as complex as a telephone operating utility can go on losing money for years without visible effect. Some of them actually have been in that position for a long time and don't know it yet. A good many of them discover it when the need arrives for a depreciation fund, and there isn't any. But it is inevitable that a losing corporation that cannot change its status must quit sooner or later. The final accounting may be postponed for a long, long period; but it comes.

The only way to quit a bad habit is to quit it; and inadequate rates is a bad habit. If you are giving service for less than it costs, raising the price calls for no apology. It is no part of an operator's duty to give anything away free.

Rates ten per cent lower than they should be is just the same as having ten per cent of your subscribers on a free list. Your commissions, even your city councils, would not stand for that. But so long as you do not discriminate, they will stand for your low rates, just as you would be willing to have your grocer lose money on the eggs he sells you.

In most states you need official permission before you can increase your rates. Get permission, then. They can't refuse it if you can prove you need it. Don't be afraid of losing subscribers. They will come back. People must have telephones, and so long as your rates are only reasonable, and you have right on your side, your increase will not hurt you.

If your competitor's rates are too low, and he knows it and doesn't care because his deficit is being charged against a profitable exchange somewhere else, where there is no competition, lay the whole case before your commission.

Call its attention not merely to the rates in your community, but to your competitor's rates in other communities.

In other words, fight.

The cost of telephone service has increased along with everything else. There is no good reason why a telephone operator should not have as much gumption as a grocer, and take the revenue to which he is legally, morally and ethically entitled.

Poles Purchased in 1915

Bulletin No. 519, United States Department of Agriculture

BY ARTHUR M. McCREIGHT

THE Forest Service, through its Office of Industrial Investigations, has compiled statistics on the number of poles purchased during 1915 in the United States by the telephone and telegraph companies, steam and electric railroads, and electric light, heat, and power companies. The census was taken exclusively by correspondence with approximately 17,000 purchasers, representing practically all the pole users in the country. About 12,000 concerns returned schedules in reply to either the first or the second request for data. This was 70 per cent of the total number of concerns to which inquiries were sent. Actually, however, the figures given in this bulletin represent between 90 and 95 per cent of the poles purchased, because the non-reporting companies were principally the smaller ones.

Information regarding the prices paid for the various species of poles was not requested.

Table I shows the number of poles purchased each year from 1907 to 1911 and for the year 1915, by kind of wood. Figures for 1911 and previous years were taken from reports compiled in co-operation with the Bureau of the Census. Statistics were not obtained for the years 1912 to 1914.

TABLE I. POLES PURCHASED, BY KIND OF WOOD, 1907 TO 1911 AND 1915.

Kind of wood—	1915	1911	1910	1909	1908	1907
All kinds	4,077,964	3,418,020	3,870,694	3,738,740	3,249,154	3,283,268
Cedar	2,521,769	2,100,144	2,431,567	2,439,825	2,200,139	2,109,477
Chestnut	651,643	693,489	677,517	608,066	516,049	630,282
Pine	546,233	161,690	184,677	179,586	116,749	155,960
Oak	199,442	199,590	265,290	236,842	160,702	76,450
Cypress	67,644	72,995	75,459	77,677	90,579	100,368
All other	91,233	190,112	236,184	196,744	164,936	210,731

A total of 4,077,964 poles were reported as purchased during 1915, which represents an increase of 659,944, or 16 per cent, as compared with the number reported purchased in 1911. It is the largest number of poles reported in any single year.

The annual demand for poles, which now exceeds 4,000,000, was supplied principally from three different regions of the United States: The northern white-cedar region of the Lake States, the chestnut region of the eastern portion of the country, and the western red-cedar region of the Northwest, which includes Idaho, Oregon, and Washington.

The principal properties called for in pole timbers are durability, strength, lightness, straightness, and a surface which takes climbing irons easily. All of the species of cedar reported purchased combine practically all of these properties in a high degree.

Cedar (including northern white, western red, southern white, and red) supplied 2,521,769 poles, or 61 per cent of the total number purchased. This is an increase of 421,625 or 16 per cent, as compared with the number purchased in 1911.

Next to cedar comes chestnut, which showed a decrease of 42,846 poles, while pine showed an increase of 384,543, or 70 per cent, as compared with the 1911 purchase. Most of the pine reported was that commonly known as southern yellow pine, and includes longleaf, shortleaf, and loblolly. Of these, the longleaf is the most durable. It is reported that loblolly pine gives very brief service unless it is treated with a preservative. Western yellow pine was also reported in small quantities, but, like loblolly, it requires a preservative treatment to insure reasonable length of service.

Oak poles were purchased in practically the same number as in 1911, while cypress poles showed a decrease of 5,351 poles. The use of cypress as a pole timber seems to be falling off each year. Cedar, chestnut, and pine together formed over 91 per cent of all poles reported purchased, cedar alone, as before stated, constituting over 61 per cent.

The minor species reported were redwood, spruce, tamarack, and Osage orange. All of these, however, were reported in small quantities.

Table II shows the number of poles purchased in 1915, classified according to class of purchaser and kind of wood.

TABLE II. POLES PURCHASED, BY CLASS OF CONSUMER AND KIND OF WOOD, 1915.

Kind of wood—	*Total.*	*Telephone and telegraph companies.*	*Electric railways, light and power companies.*	*Steam Railroads.*
All kinds	4,077,964	1,680,880	1,430,122	966,962
Northern white cedar	1,747,210	1,029,219	239,864	478,127
Chestnut	651,643	336,496	275,304	39,843
Western red cedar	567,770	105,590	422,312	39,868
Pine	546,233	69,787	388,210	88,236
White oak	177,799	34,644	13,110	130,045
Red cedar	117,545	21,386	8,424	87,735
Southern white cedar	89,244	16,661	14,686	57,897
Cypress	67,644	24,162	18,174	25,308
Red oak	21,643	6,912	13,001	1,730
All other	91,233	36,023	37,037	18,173

As indicated in that table, the principal purchasers of poles were the telephone and telegraph companies. They reported 44 per cent of the total number purchased. The electric railways and power companies purchased about 35 per cent of the total, while the steam railroads purchased 21 per cent.

A decrease of 721,844 poles, or 30 per cent, was reported by the telegraph and telephone companies as compared with the number purchased by these companies in 1911, while the electric railways, light, and power companies reported an increase of 642,473 poles, or 44 per cent. The steam railroads reported an increase of 739,315, or 76 per cent, as compared with their purchases in 1911.

Table III shows the number of poles purchased, classified by length and by kind of wood. Poles are usually purchased in the round form, although occasionally a purchaser reported several species being sawed. However, these are of minor importance and were either redwood or western pine.

TABLE III. POLES PURCHASED, CLASSIFIED BY LENGTH AND BY KIND OF WOOD, 1915.

Kind of wood—	*Total.*	*Under 20 feet.*	*20 to 29 feet.*	*30 to 39 feet.*	*40 to 49 feet.*	*50 feet and over.*
All kinds	4,077,964	1,236,694	1,531,441	980,091	256,236	73,502
Nor. white cedar	1,747,210	540,565	755,311	373,874	67,358	10,102
Chestnut	651,643	23,992	255,951	295,717	63,676	12,307
West. red cedar	567,770	17,874	315,010	139,041	71,608	25,237
Pine	546,233	373,688	69,931	65,004	23,914	13,696
White oak	177,799	120,393	33,550	16,120	5,998	1,738
Red cedar	117,545	94,997	14,870	5,624	1,541	513
So. white cedar	89,244	4,414	13,282	49,264	15,734	6,550
Cypress	67,644	13,048	22,211	26,316	4,542	1,527
Red oak	21,643	3,737	16,341	1,280	139	146
All other	91,233	43,986	35,984	7,851	1,726	1,686

Poles are generally classified commercially in 5-foot lengths and by diameters at specified points, principally at the tops and 6 feet from the butts. To condense the figures the poles shown in the above table are divided into classes differing in length by 10 feet.

Of the total number purchased 2,768,135, or 67 per cent, were under 30 feet. Poles of these lengths are most commonly used by the telephone and telegraph companies. The poles under 20 feet in length were reported chiefly by the rural telephone companies. Among the prominent woods reported under this classification were northern white cedar, pine, and white oak. The number of poles ranging from 30 to 50 feet in length aggregated about 30 per cent of the total, while those exceeding 50 feet in length represent but a small proportion.

All of the leading woods covered by the table contributed poles of all lengths, although red oak contributed but a small per cent of the larger poles. More than half of the white-oak and pine poles were under 20 feet in length.

In comparing the 1911 purchase of poles with the 1915 purchase, an increase of 832,966 poles under 20 feet in length was reported, while the number between 20 feet and 30 feet showed a decrease of 330,375. The total number of poles purchased in the other lengths did not vary greatly from the 1911 figures, slight increases in all being reported for 1915.

PRESERVATION

One of the most important factors in determining the value of a pole is its ability to resist decay in contact with the soil. While durable woods are generally preferred as pole timbers, there is a tendency toward purchasing other species which are not as durable, but which can be rendered less liable to decay by preservative treatment.

In the treatment of poles several methods are used. Among these are the brush treatment; the open-tank treatment, in which the poles are stood on end in open tanks or vats containing the preservatives; and the pressure treatment, in which the poles are placed in cylinders into which the preservative is then run and pressure applied to force it into the poles. Much progress is being made in the butt treatment of cedar poles by the open-tank method, which is being used extensively in Idaho, Washington, and California, and in the Minneapolis and Chicago districts. A considerable proportion of the cedar poles sold receive a butt treatment.

The Forest Service did not request information relative to the number of poles treated by the various railroads and other companies reporting the purchase of poles. It has, however, obtained information from 102 treating plants operating throughout the United States. These plants reported a total of 125,639 poles treated in 1915, which is estimated to be about one-half of the actual number subjected to treatment. A large number are treated merely by applying the preservatives with a brush, and these were not reported.

It is impossible to submit a tabulated statement showing the number of poles treated by the different kinds of preservatives, owing to the lack of detailed information obtained. In treating the poles in 1915 the principal preservative reported was creosote oil, the average absorption being about 11 pounds to the cubic foot. About 85 per cent of the poles treated were yellow pine, while others reported were western red cedar and Douglas fir.

The cost of treating poles varies according to the kind of wood treated, kind and quantity of preservative used, and process employed, but experience has demonstrated that the adoption of a pole-treating policy generally proves economical and insures added life to the poles in service.

Compound For Rebuilding Dry Batteries

The war in Europe has caused a scarcity of various articles once available in large quantities, and much effort and ingenuity have been made by all the warring nations toward finding substitutes for one thing and another. It had been the custom abroad until almost a year ago to use wheat or rye flour for thickening the electrolyte of dry batteries, but since there is now rather a scarcity of these cereals attention has been turned to other substances. Of these kieselguhr, water-glass, gelatine, starch, sawdust and glass-wool seem to have proved satisfactory. One of these products, or an admixture of several of them, is used as the base or binder. For the electrolyte proper is used well-powdered salammoniac, calcium acetate, zinc chloride and thin refined glycerine in the proportion of about equal parts of salammoniac and the calcium acetate, 80 grams of each, 40 grams of the zinc chloride and 10 grams of glycerine. The mixture is stirred energetically after being covered with distilled water at a temperature of 40 deg. C. and until all solid matter is dissolved and thoroughly mixed in one concentrated solution, which is then allowed to be taken up by the binder, forming a paste which is then applied between the plates of the cell or battery to form the electrolyte. The whole is inclosed in a casing of paraffine fitted with vents for the escapement of gas. The addition of equal parts of calcium acetate and salammoniac is said to make a very satisfactory mixture, one which has high conductivity and does not crystallize, nor is it hygroscopic.—*Electrical World.*

A. T. & T's Central Union Holdings Void

Epoch-Making Decision By Judge William E. Dever

JUDGE WILLIAM E. DEVER, before whom the suit brought by certain minority stockholders of the Central Union Telephone Company against the American Telephone and Telegraph Company was tried, handed down on Saturday, January 20, 1917, a voluminous opinion dealing with all of the intricate questions of law and fact which were involved in this now famous litigation. Some idea of the magnitude of this case can be gathered from the fact stated by the court that the record covered some 30,000 pages and included hundreds of intricate exhibits.

The suit was started four years ago by William A. Read and other stockholders of the Central Union Company and subsequently A. A. Beebe, Ernest M. Kimball, Frederick W. Schwamb and other Chicago stockholders intervened in the proceeding as co-complainants. The defendents in the suit were the A. T. & T. Co. of New York, the parent company of the Bell system, the Central Union Telephone Company and all of its officers and directors, including President Theodore N. Vail and Vice-President Union N. Bethell of the A. T. & T. Co. and B. E. Sunny, president and H. F. Hill, vice-president of the Chicago and Central Union companies. The Western Electric Company was also made a party defendant to the proceeding. The court summarized his opinion subsequently as follows:

He held that all of the stock, having a par value of some $5,200,000, held by the A. T. & T. Co. in the Central Union Company was null and void because under Section 26 of the general incorporation law of the State of Illinois a foreign corporation doing business in Illinois can exercise only such powers as can be exercised by Illinois corporations of like character and under the decisions of the Supreme Court of this state an Illinois corporation cannot own stock in another company engaged in the same line of business.

As a further ground for holding the stock of the American Company illegal and void, the court held that the inevitable tendency of the purchase of stock in the Central Union and other Bell subsidiary companies, such as the Chicago Company, the Western Electric Company and other subsidiary companies, was to suppress competition in the telephone business and to create a monopoly of such business, and the court held that under the decisions of the Supreme Court of Illinois, notably the case of Dunbar against the American Telephone and Telegraph Company which involved an attempted purchase some years ago of the stock of the Kellogg Switchboard & Supply Company, it was illegal for an Illinois or foreign corporation to buy up stock of an Illinois corporation when such purchase would have the tendency to suppress competition.

The court stated a third ground for holding the stock of the American Company illegal and void and that was that the evidence in the case disclosed that this stock had been acquired and held by the American Company at all times for the illegal purpose of suppressing competition and creating a monopoly; that the fundamental plan of the whole Bell system from its inception had been to build up a country-wide and illegal monopoly of the telephone business, and the court went at length into the history of the Bell system and the different methods that had been adopted to suppress competition and create this monopoly.

Referring to the public utility law which was passed after the bill in the Central Union case had been acquired, the court held that this act could not in any event affect the legality of these prior transactions or make valid a holding of stock which before had been invalid and illegal; that the fundamental public policy of the state of Illinois against unregulated monopoly remained unaffected by the passage of this act, but that under the provisions of this act it was a question for the Public Utilities Commission to determine in each case how far there should be regulated monopoly and how far there should be regulated competition and pointed out that this act in no way indicated that the public policy of Illinois would now sanction the creation of a country-wide monopoly such as the Bell system is.

In addition to holding the five million of stock of the American Company in the Central Union Company illegal and void, the court held that the complainants in the case suing on behalf of themselves and all other stockholders in the Central Union Company similarly situated were entitled to an accounting against the A. T. & T. under a variety of intercorporate contracts or relations between the A. T. & T. and the Central Union. The court based his decision in this connection on the domination and control which had at all time been exercised by the A. T. & T. and its officials over the officers and affairs of the Central Union. He pointed out that very many important contracts and transactions of the Central Union had never been passed on in any way by the board of directors of that company; that these intercorporate contracts and relations had been made by the A. T. & T. without any real representation on behalf of the Central Union Company and that these intercorporate relations were in effect contracts made by the A. T. & T. with itself.

He commented on the duty of the directors and officers of the Union Company to show an undivided loyalty to the Central Union Company and its stockholders, and on the fact disclosed in the record that they really regarded the A. T. & T. and not the Central Union as their real master. That the Central Union had thus been prevented from enjoying advantages and profits which it would have had if it had had independent officers and directors free from the domination of the American Company. He held in short that the American Company as majority stockholder had dictated the election of the officials of the Union Company and had controlled its officers in all particulars.

The court took up in detail a variety of the intercorporate relations which had existed between the Central Union and the A. T. & T. and held that the accounting should cover several of these relations, such as the division of tolls between the two companies on telephone messages handled jointly over the lines of the two companies. He also ordered an accounting of the transactions under the so-called 100-mile contract entered into in the year 1894 pursuant to which the Central Union had been deprived of the handling of business in its territory between points more than 100 miles apart, the

Central Union being required to turn over such business to the American Company without regard to whether or not the Union Company had existing facilities for handling the same or not.

He also ordered an accounting of the leased wire business handled by the American Company in and out of Central Union territory. He also ordered an accounting from the American Company because of its action in causing the Union Company to call in for redemption in the year 1912 $6,000,000 of the Union Company's outstanding bonds and paying for such redemption a premium of $300,000, of which $50,000 went direct to the A. T. & T. These bonds in part bore interest at 5 per cent and in part bore interest at 6 per cent and were unmatured and undefaulted and had a number of years yet to run. To accomplish this redemption the Union Company borrowed money from the American Company at a higher rate of interest and gave demand notes therefor so that the net result of the transaction was to convert unmatured undefaulted long time obligations into demand notes bearing a higher rate of interest at an expense to the Union Company of over $300,000 and without any substantial benefit whatever accruing to the Union Company therefrom.

The court also held that the complainants and the Union Company were entitled to an accounting of the indebtedness claimed by the American Company to be due to it from the Union Company and amounting at the present time to over $45,000,000. The American Company had in this litigation filed a cross-bill asking for judgment for the amount of this indebtedness against the Union Company, but the court held that any action on this cross-bill would be postponed until after the accounting between the parties, and that the American Company could recover thereon only such amount as was shown to be just on the accounting and as represented the true benefit to the Union Company from the alleged loans to it.

The court denied the prayer of the complainants for an accounting on account of the purchases made by the Central Union from the Western Electric Company of all telephone equipment and supplies without any competitive bidding and held that the so-called 4½ per cent payment made by the Union Company to the A. T. & T. each year based upon the gross income of the Central Union Company did not represent more than the true value of the rental of instruments furnished by the American Company and the value of the miscellaneous engineering and other service by the American Company's general staff to the Union Company. The court held on this item that if treated as representing the rental of instruments alone the 4½ per cent payment had at all times since the expiration of the fundamental patents in 1894 been excessive and that in an action at law no recovery could be had by the American Company for services which it claimed to have rendered as part consideration for this payment but not specified in any contract either oral or written. The court held, however, that in this equitable proceeding the form of the contracts could be ignored and that an allowance could be made for the services rendered and that allowing for such services and the rental of instruments together, the payments were not excessive and that an accounting therefore should not be given on this item.

The court also denied an accounting on one small item of the rental of pole attachments.

As to the charge of the complainants that excessive rates of interest had been charged by the American Company on loans made by it to the Union Company, the court held that inasmuch as the American Company could only recover the legal rate of interest on the just amount of the indebtedness as the same should be proven, the complainants were not entitled to a separate accounting on this item of interest.

As to the expenditures made by the Union Company in its territory in building up its plant and fighting Independent telephone competition, the court held that this fight had been made by the Central Union for the joint benefit of itself and the Bell System as a whole; that all of the expense had been borne by the Union Company, but that in equity the A. T. & T., representing the Bell System, should be required to bear its proportionate part of the expense and that in the accounting this should be taken into consideration and proper allowance made.

The court commented on the fact that the exchanges and stations of the Union Company were absolutely essential to the A. T. & T. in Central Union territory, the A. T. & T. messages originating or terminating on these Central Union owned and operated terminals; that while it was true that the Union Company had undoubtedly secured a benefit from its connection with the A. T. & T., it was impossible to tell how much that benefit had been or what would have been the history of the Union Company without this connection; that it could in all probability have existed independently and developed its own system of exchanges and toll lines, but that on the other hand the A. T. & T. could not have profitably developed any of its business in Central Union territory without the Central Union terminals or without duplicating them.

In addition to passing on the above important issues in the case the court commented at length on the facts which brought about the filing of this suit. He pointed out that a meeting of the stockholders of the Central Union was called January 18, 1913, for the purpose of authorizing the sale of all of the assets of the Central Union Company; that the complainants upon investigation learned that the plan contemplated by President Sunny of the Central Union Company was to sell out all of the Illinois assets of the Union Company to the Chicago Telephone Company owned and controlled by the A. T. & T. and to sell all of the assets of the Union Company in the states of Indiana and Ohio to other Bell companies; that the aggregate price to be paid for all of these assets was some $2,000,000 less than the alleged indebtedness from the Central Union to the A. T. & T. and that the inevitable result of the transaction would be to wipe out all stock interests of the minority stockholders while the American Company would continue as in the past to own and control, through its subsidiary companies, the plant and business of the Union Company. The court made frequent references to the conduct of President Sunny and General Counsel Richardson of the Union Company as having been in the interest of the A. T. & T. rather than in that of the Central Union and the effect of his decision in this connection is to show that the minority stockholders were forced into this litigation for the protection of their rights in a corporation where they had held a *bona fide* investment for many years, one of them dating back to 1883. The court commented several times on the fact that the Union Company had paid no dividends since the year 1896. The court in commenting on this attempted sale of 1913 said:

Here, again, the matters last referred to are considered in

connection with the question of purpose. It should be borne in mind that Mr. Sunny and Mr. Richardson were the men who were responsible for the proper management of the affairs of the Union Company and whose first duty it was to so conduct those affairs as to best conserve the interests of its stockholders. Yet, notwithstanding this fact, it appears without question or doubt that these stockholders' interest would have been completely eliminated and had not the American Company's officials interfered, and on this evidence we have the case of these officials of the Union Company, and particularly Mr. Sunny, urging that the property of the Union Company be sold for a lower price than the representatives of the American Company thought should be paid for it.

The reference of this court in this connection to the action of the American Company's officials that would have prevented the sale related to testimony of Mr. Bethell and others that it was their purpose at the meeting of the stockholders called for February 11 to take no action that was opposed by all or most of the minority stockholders. This purpose on the part of Mr. Bethell was never communicated to the minority stockholders and they knew nothing of it, if it existed at all, until hearings in this case. The thing that of course effectually prevented the holding of the meeting and the sale of the assets was the injunction order of the court.

The court in referring to the redemption of $6,000,000 of the Central Union Company's bonds in 1912 said:

It seems indisputable that if the officers of the Union Company were acting in a wholehearted way in the interests of the stockholders of that company this transaction would never have taken place. I have not been able to believe and do not now believe that the men who engineered this transaction had given much thought to the interests of the minority stockholders of the Central Union Company. This matter of the bond redemption will be referred to in connection with another matter, but here it is considered for the purpose of pointing to the character of the control of the parent company and the manner in which these officers did in fact perform their duties. It is not reasonable to believe that while the men involved in this transaction might not intentionally have indulged in conduct unfair or dishonest in itself, that they in fact had in mind only a principal interest in the whole transaction—and that the interest of the American Company, their actual employer.

On the general subject of the absolute control and domination exercised by the American Company over the Union Company's affairs, the court made a great many striking statements. Among others we quote the following:

These men, the officials of the Union Company, must have continually appreciated the fact that the real master in the involved and intricate relations between these two companies was the American Company or Bell Company, and when called upon, as they frequently were, to pass upon matters of great importance where the interests of these companies were not identical, it would not be surprising if the parent company did get the better of the bargain. . . .

It is not denied that the American Company did in fact select the responsible officers, i. e., the president and manager of the Union Company and an examination of the evidence will disclose that these responsible officers did in fact transact business and determine policies of the most fundamental importance to their corporation without in many instances having any authority to do so from the board of directors or stockholders of the Union Company. Contracts of vital importance to the Union Company were entered into with the parent company without any authority, approval, or so far as this record shows, the knowledge of the Union Company's board of directors; and these same officers in pursuance of a policy to be hereafter discussed have as agents of the Union Company incurred an indebtedness to the parent organization of more than $30,000,000—about six times the amount of the authorized capital stock of the Union Company—without the approval or authority as to a large part of such indebtedness of the board of directors of the Union Company.

The court's opinion on the monopoly plan of the Bell organization which he finds had been in effect from the very beginning, was most explicit and emphatic in its condemnation. Among other things the court said:

The parent telephone organization seems early in its history to have indulged the error that the telephone business of the nation of right belonged to it.

Speaking of the peculiar character of the telephone business and the attempt to justify its monopoly on the ground of alleged benefits to the public, the court said:

The peculiar circumstances of the business and its unusual history do not render it an exception to those rules of law which have been created for the protection of the public from any and all kinds of illegal exploitation.

Speaking in particular of the ownership of stock by the American Company in the Central Union, the court said:

The bill charges and the evidence shows that the American Company acquired the stock of the Union Company for the purpose of enabling the American Company to conduct its telephone business in Illinois, in Indiana, and in Ohio. It did not purchase for the purpose of investment or to secure a debt, but solely for the purpose of enabling it to conduct its general telephone business in the territory of the Union Company—and no other pretension is here made. *It is evident that to permit the transaction of business by a foreign corporation which right or power is denied to an Illinois corporation of like character would be to open the doors to abuses greater, if anything, and less easily remedied, than if such power were exercised by a domestic corporation.*

Speaking of the Dunbar case decided by the Supreme Court of Illinois against the A. T. & T. some years ago, Judge Dover said:

Whatever doubt may exist as to what was decided in the first Dunbar case, the Supreme Court in its decision in the second case held that there was a total want of power in the American Company to purchase control of a competing Illinois corporation and this holding it seems to me was wholly apart from any consideration of the question of illegal purpose. As I read the decision it is obvious that the Supreme Court meant that the purchase by the American Company of a controlling interest in a competing Illinois corporation was illegal, because the fact or act itself was against the public policy of this state in that its tendency was violative of such public policy that there was in fact a total lack of power to make such purchase.

The court held that there had been suppression of competition on the part of the A. T. & T. not only between the Central Union Company and the A. T. & T. so-called long distance lines, but also in the entire telephone business of the United States. The court after holding that "the policy of the State of Illinois, is, and prior to January 1, 1914, has been opposed to monopolies. Such also is the public policy of the United States, held:

The foot that the parent company through its stock control of the Union Company or its ownership of the fundamental telephone instruments patents saw fit to prevent the Union Company from freely exercising its charter powers does not take from the Union Company its competitive status with relation to other companies having power to do a telephone business in the territory served by the Union Company's lines. The evidence in this case discloses a long continued purpose to suppress competition. This purpose is evidenced by a series of contracts and arrangements between the American Company and the Union Company extending over a period of more than 30 years. This is not a case where the court is called upon to deal with a single illegal contract or relationship, *it is rather one where it is shown that competition in a public service business has been suppressed by an intricate and far-reaching attempt to monopolize the telephone business of the entire country.*

Speaking of the different subsidiary companies throughout the United States, the court said:

In a very few cases it (the A. T. & T. Co.) held slightly less than a majority of the stock, but it is quite evident from the evidence here *that its control of all of these companies by reason of its stock ownership and physical line connections was wellnigh absolute.*

The court in pointing out the extent of the Bell monopoly said:

The vision of the early promoters was to own or control wherever possible any and all companies doing a telephone business in the United States and it is perfectly clear that its

control of the three Illinois corporations above referred to is merely indicative of its general purpose to control the telephone business of the country. The American Company had an almost exclusive control of the business in those parts of the country where the population was densest and the business transacted was greatest. While it is quite evident that this control over this great industrial business was accomplished in the main by stock controls, there were many other important ways and means by which the control of the parent company was made more complete and effective.

Speaking of the purchases of stock from minority holders made by Richardson, while president of the Union Company, for the American Company, the court said:

That this conduct was such that it is impossible to escape the conclusion that the interest of the minority stockholders in these transactions was of little or no consequence to him; that he, Mr. Richardson, was working in the interest of the majority stockholder to acquire the stock of the minority at the lowest price possible and that he deprecated any news or happening that might tend to raise the price of this stock in the market.

Speaking of the effect of the public utility act which went into force January 1, 1914, the court said:

The title of the parent organization to the stock of the Union Company was from the beginning illegal and void and the passage of the public utilization act could not have had the effect of breathing life and vitality into a transaction which never had any vitality whatsoever.

As hereinbefore indicated, my opinion is that the public policy of this state with relation to public utilities has been changed by the passage of this act from a policy against monopolies to a policy in favor of regulated monopoly or regulated competition depending upon the circumstances of each particular case to be determined under the law by the exercise of the sound judgment of the commission created by the act. *Nothing that has been presented to this court either in the oral argument of counsel or in the authorities cited by them supports the theory that the passage of this act could have the effect of legalizing the control by a foreign corporation of an Illinois competing corporation that control being acquired as incidental to a purpose to monopolize the telephone business of the state and country.*

Under the facts of this case this construction (urged by defendants' counsel) of the act would have the effect of giving to the American Company a special, and in a very large sense, an exclusive, monopoly of the telephone business in the State of Illinois. The result of such holding would be to render valid acts committed in the creation and maintenance of monopolies and in the suppression of competition however oppressive or disastrous they might be to the public welfare.

Coming to the question of the right of the complainants to an accounting the court said:

The evidence discloses that the board of directors and responsible officers of the Union Company were in fact selected by the majority stockholders; that the board of directors of the Union Company had practically nothing to do with the formation of the policies of the Union Company; that the Union Company's directors had but little to do with the approval of its most important contracts and relations and that they have failed to act in any way upon many questions and matters that are ordinarily left to the judgment and direction of a board of directors. *We have here the case of a corporation whose majority stockholder actually conducts the business of the corporation.*

On the whole record in this case I am inclined to the view that the defendant American Company must be regarded and treated as a fiduciary with relation to its transactions and dealings with the Union Company.

Speaking of the 100-mile contract the court said:

It is true that on its face this contract is terminable by ten days' notice, and had the contract been made between persons free to exercise their own independent judgment in the matter, much of the criticism here made would not be valid; but in a foregoing part of this opinion it is held that in the execution of this, as well as other important contracts, the Union Company was only nominally represented, and that the making of this contract was in fact only another form of the expression of the will of the Bell Company in determining to what extent the interests of the Union Company's stockholders might be disregarded in the execution of contracts of fundamental importance to both companies.

My conclusion is that this contract was not entered into by the officials of the Union Company with an eye single to the best interests of the stockholders of the Union Company; that underlying this arrangement was the purpose of the parent company to dominate the telephone business of the country and to subordinate the interests of the Union Company to the welfare of the Bell System as a whole.

The evidence in this record shows that under the 100-mile contract the Union Company has given up to the American Company the transaction of business in certain parts and along certain routes in its, the Union Company's, territory which, under judicious management, would have been profitable to the Union Company had it retained the doing of such business to itself. (Kempster B. Miller's testimony.) Had the business of the Union Company from the beginning been developed as a single business, without relation to any interest that the parent company might have in the doing of that business, it is clear that the Union Company with profit could have transacted a large volume of business which was in fact given over to the parent company.

Dealing with the originating commission the court held that the Union and American companies were practically in the position of partners in jointly handling the long distance telephone business, and the court said:

On the whole evidence upon this subject I am of the opinion that the provisions of the contract of 1891 under consideration and the practice and methods of the parties under them were not fair to the Union Company. No evidence is contained in this long record as to the expense or profits to the American Company for the doing of this joint business; that the Union Company did not profit by this arrangement is almost certain. The evidence satisfactorily shows that during the year 1912 the Union Company rendered this service to the American Company for less than actual cost. Mr. Van Meter's testimony discloses that the average payment per message to the Union Company for the year 1912 was 12.59 cents and that it cost the Union Company to perform this service during 1912 the sum of 12.83 cents per message—a loss to the Union Company of .25 cents per message.

With regard to the complaint made by the minority stockholders growing out of the routing arrangements by which messages originating on Central Union lines were transferred to the American Company's lines at the nearest point, the court denied an accounting on the ground that it was impossible to determine the measure of damages. The court said:

Upon a careful consideration of the evidence on this subject I have come to the conclusion that an accounting should not be directed, even though it be assumed that the Union Company's stockholders were treated unfairly by reason of this practice. To determine at this time what this loss, if any, amounts to is quite an impossible task, and I am not at all clear that any basis for such an accounting can be indicated which would even approximately result in doing justice to the parties here.

Speaking of the 4½ per cent contract for rental of instruments the court said:

From all of the evidence in this record pertaining to this subject I am of the opinion that aside from a question of the value of certain services, to be hereafter considered, the Union Company since the year 1894 and down to the present time has paid an excessive price for the use of the instruments furnished to it by the parent company.

In spite of this the court held that no accounting should be had under the 4½ per cent contract because of services rendered by the general staff. In this connection the court said:

There is no evidence in this record from which the actual value of the services referred to may be determined, but there is no doubt in the mind of the court that the value of such services was as great as, if not greater than, the excess charged to the Union Company, as above indicated, for the rental of telephone instruments.

Speaking of the losses caused the Union Company by reason of the fight against Independents the court said:

In the interest of its stockholders the officers of the Union Company might have restricted the field of its operations rather than to expand it, and it is not unreasonable to suppose that thereby competition could be met in limited territory without loss or impairment of its, the Union Company's, capital; but it was in fact the creature of the American Company, it had no independent policy of its own, and its officers at no time, so far as this record shows, attempted to solve the difficulties of the Union Company arising from this competition by regarding solely the interest of the stockholders of that Company. The continuous effort seems to have been to oppose competitors in the interest

of the Bell System, and this necessarily included the long distance business of the American Company.

The court also commented on the purchase by the Central Union at an expense of $378,000 of the plant of the Independent company at Quincy, Illinois, which both Mr. Sunny and Mr. Richardson had said was not worth more than $300,000, this purchase at the higher figure being for the interest of the American Company although the latter did not contribute any part of the purchase price.

The court also commented on losses accruing to the Central Union Company by reason of rate wars with the Independents, the benefit of which accrued jointly to the Central Union and to the American Company, and held that the American Company should bear a fair proportion of the loss or expense which the Union Company had borne.

The court also commented on the losses incurred by the Union Company in the building of exchanges at unprofitable points which furnished additional terminals to the American Company and were of benefit to it and held that the American Company "should pay its fair share of any loss or expense incurred in maintaining and extending the Union Company's plant and facilities."

In referring to the conduct of the principal officers of the parent company such as Mr. Vail, Mr. Fish and Mr. Bethell, the court said:

As to this contention of counsel it may be answered that this court does not mean to intimate that the principal officers of the parent company at any time believed that their conduct was dishonest or immoral; the illegality and the unfairness of this conduct were, no doubt, the result of an imperfect knowledge of the law and a too intense devotion to the realization of the fundamental purpose which was adopted as a basis for all of the actions of the parent company. It is frankly admitted that the purpose and intent of the parent company was and is to control under one central organization all of the telephone business of the country, and this monopoly purpose has in a large measure been effected by the parent company in two ways—first, by engaging directly in a telephone operating business, and, second, by acquiring and holding a stock control in many subsidiary companies throughout the United States. In giving effect to this principal purpose of the parent company the legal rights of the minority stockholders of the Union Company were, in many important ways, lost sight of, and it is fairly deducible from all of the evidence in this long record that the Union Company has been regarded and treated merely as an auxiliary or feeder to the parent company's long distance lines.

At the close of his opinion Judge Dever asked counsel in the case to prepare and submit a degree embodying the findings and orders outlined in the opinion. Pursuant to this request counsel are engaged in preparing such decree and will submit the same to the court at an early date.

The complainants in this case from the beginning have been represented by the firm of Cassoday, Butler, Lamb & Foster, Stephen A. Foster, Rush C. Butler, Cornelius Lynde, Herbert Pope, and Beverly B. Vedder of that organization having been particularly active in the trial of the case. Albert M. Kales has been associated with them particularly in the preparation of briefs on the law. The defendants were represented by counsel including John P. Wilson, Nathaniel C. Sears, Charles S. Holt, William P. Sidley, Edgar B. Tolman, William B. Mann, Eugene S. Wilson, all of Chicago, and Nathaniel T. Guernsey, George V. Leverett, Charles D. M. Cole of New York and Judge W. D. McHugh of Omaha.

State Control or Federal?

When the first American steam railroad was laid down in South Carolina the builders created an instrumentality of commerce within a state, says Frank W. Noxon, secretary of the Railway Business Association, in *The Nation's Business*. The hand of Uncle Sam was ready to grasp interstate commerce by rail when human cunning should in the process of the suns create the thing. Morse stretched the telegraph between Baltimore and Washington. He had brought into the world full-fledged an instrumentality of interstate commerce. There was the power of regulation waiting for it; although Congress did not exercise this until the end of the first decade of the twentieth century. Alexander Graham Bell talked over the telephone from one room to another in Boston with his friend Watson. No amendment to the Constitution was required between that day in 1876 and the day in 1910 when Congress authorized the Interstate Commerce Commission to regulate lines over which interstate intercourse was conducted.

Some months ago a number of New Jersey business men discussed certain proposals for enlargement of federal scope in the regulation of railways. Congress was then about to organize a joint committee of both Houses to consider these and other proposals for correction of defects in railway regulation. Two of those present manifested anxiety.

One asked: "Would you turn over to the Interstate Commerce Commission all the functions that are now performed by the Board of Public Utility Commissioners of New Jersey?" To this another replied: "I specify three particulars in which it seems to me wise that the federal power should be exercised—compulsory incorporation, exclusive regulation of security issues and regulation of rates where they affect interstate commerce. What may be urged by others now or in the future as a desirable subject of federal regulation I do not predict. As to the power, nothing new is needed. Federal jurisdiction has from the ratification of the Constitution been complete over whatever affects interstate commerce. The question with regard to any sphere is this: First—does it affect interstate commerce? Second—is it desirable at this time for Congress on behalf of the state to exercise regulation over it?"

The other Jerseyman inquired: "Aren't we going to get into a whole lot of trouble? Where will this lead to? How do we know that Congress may not want to regulate insurance and manufacturing processes?" The answer was this: "What do you care where it leads? If a certain class of transactions are interstate and the practical situation demands unified regulation the question of exercising the power is wholly one of popular consent or demand. In the case of railroads we have already been up through the Supreme Court and found out that the power is there. Why worry? If any business is interstate and can best be regulated federally, let us go to it."

The thought that if a thing becomes interstate it thereby becomes national and should pass under federal supervision is still laboriously making its way. Thus obstinately does the mind of man cleave unto an idea many times abandoned if only it appear on each new occasion in slightly variant disguise. It has been obvious during the last year that rapid and pervasive progress was being made in reconciling citizens of every section to the idea that if commerce is interstate the conveyance should be regulated federally wherever the conveyance might be located. We shall shortly know how strong that conviction has become by the headway it proves to have made in Congress.

Wants to Fine for Rubbering

The evil of telephone subscribers listening in on party line conversations will be boldly tackled by the Farmers and Merchants Telephone Company of Alma, Nebraska, provided the State Railway Commission will help along with an order permitting the company to impose a fine of 25 cents upon each subscriber for each and every listening offense, the company to be the judge and jury to decide who listens and to collect the fine the same as it collects telephone rentals.

President R. L. Keester of the Alma company has proposed this remedy in an application for leave to increase residence and farm rates from $1 a month to $1.50 a month, and to increase the monthly switching charge from 25 cents to 45 cents.

Telephone companies have worried for years over plans to prevent subscribers from eavesdropping and finally someone invented a mechanical device to cut off the listener. It costs about $15 to install one of these automatic cutoffs and it is said it is worth a small fortune to keep the device in working order, so it is not in common use.

People in cities who are accustomed to secret telephone service are not worried over the subject, but in country communities where there is absolutely no guaranty of privacy in telephone talks the matter is a live issue. In a certain inquiry it was developed that a woman had rigged up a device to attach a telephone receiver to her ear. This enabled her to use both hands in peeling potatoes or other household duties, and at the same time not miss a word of conversation between telephone subscribers and neighbors for miles around.

On farm lines each subscriber has a separate signal he is supposed to answer and to answer no other signals, but in practice this is not always followed. On some farm lines and party lines in cities, no matter what signal is sounded, nearly every one along the line rushes to the telephone and listens.

Austin's Merger Situation

The telephone merger ordinance providing for consolidation of the Southwestern Telegraph & Telephone and the United Telephone companies within the city of Austin, Texas, was approved by voters of the city, 1,132 to 236.

The city commission gave out a public statement advocating the merger and giving reasons why it should be accomplished. Besides eliminating the weaker company and its hazards and dangers and adding to the one service cost much additional territory, it declares, the city will be furnished free service for police and fire alarm systems. Other pledges are as follows: To indemnify the city against damages where the telephone company is responsible; all overhead constructions on paved streets to be removed as well as all duplicate overhead wires; all employes to receive 10 per cent increase in wages; the company will immediately construct $300,000 building; city will receive the usual taxes, also $1,250 annually and 1½ per cent on gross annual income in Austin and if the city cares to purchase the plant it may do so at the end of ten years at its appraised value at that time.

The maximum charges in the consolidated franchise are to be $2 per month for residence telephones as at present and $5 per month for business telephones, as against $4 at this time.

Detroit Needs Operators

Construction work is progressing rapidly on the new Garfield exchange, Grand River avenue, near Chope place, Detroit, being erected by the Michigan State Telephone Company. It is the third new exchange building started during 1916.

Within the next few months, according to General Traffic Superintendent Downing, 800 new operators will be needed to assume duties in the new exchanges. An attractive folder setting forth the advantages of a telephone operator's situation has recently been issued in an effort to stimulate employment.

Reports of work done by the telephone company in 1916 show that 14,177 new telephones were installed. A construction program involving the expenditure of $10,000,000 was determined on by the board of directors, and $1,706,056 was spent during 1916 in extending and improving local property.

The expenditure of $3,456,000 was authorized for 1917. The company during the last year began construction of three new exchange buildings, enlarged the Walnut, Hickory, Hemlock, North and Cedar exchanges, and purchased 698 feet of frontage to accommodate future growth.

Switchboard positions for 695 additional operators were installed. Of conduit and underground cable 227,204 feet were laid and 1,155,814 feet of cable were added to the Detroit plants.

Operating cost increased 16.1 cents per telephone per month and the revenue was increased 5.3 cents per telephone per month.

Cheadle-Sterritt Company Buys Rival

After a stormy session drawn out for nearly the whole day, stockholders of the Farmers' Mutual Telephone Association of Girard and Virden, late this evening voted by a narrow margin to sell out to the Girard Telephone Company and the Virden Home Telephone Company, two concerns operated jointly by C. B. Cheadle of Joliet and E. S. Sterritt.

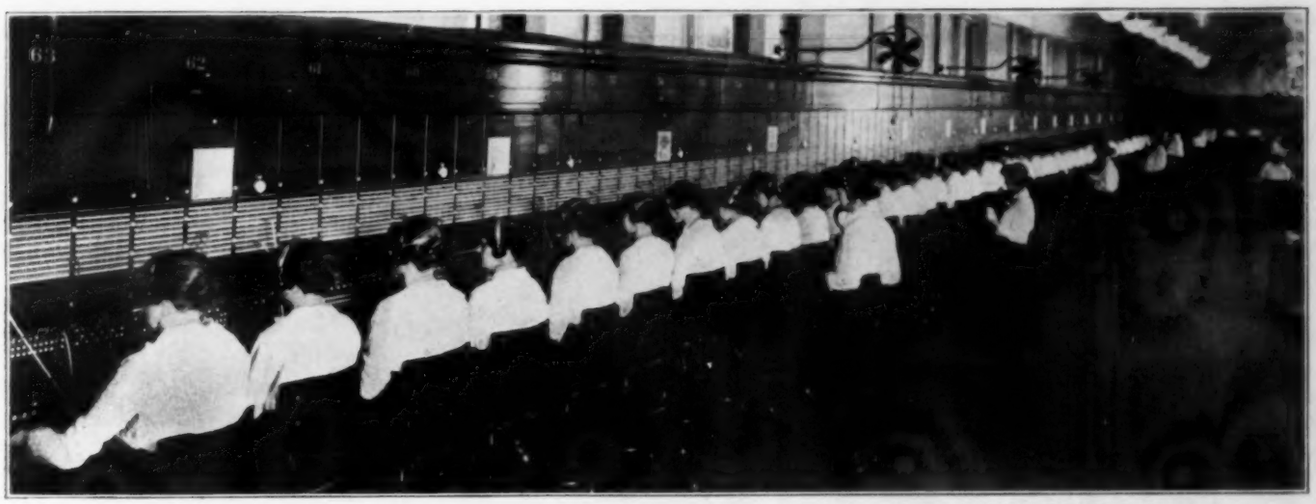
The transfer was made for $6,680. Stock from now on will sell at forty dollars a share. Opposition to the change was entirely by Virden stockholders, who feared that the venture will bring an increase in telephone rates. The company which ceases to exist by the action of the stockholders has been operating thirteen years, at an average dividend of 12½ per cent.

Nebraska Railroads Must Supply Telephones

Railroads will have to maintain telephones in stations in Nebraska, according to an opinion of the state supreme court, and cities of the metropolitan class have a right to control the use of streets and force companies to elevate their wires when a mover desires to cross a street with a house he is moving from one part of the city to another.

The court holds that the telephone is in such general use as an agent for the transaction of business that the the service of a railroad, express or telegraph company to the public is not complete without it and the element of expense is not controlling.

In connection with the opinion the court holds that the failure of the presiding officer of the senate to sign the bill covering the placing of phones in railway stations does not invalidate the law as long as the senate journal shows it was passed by that body.



Operating Room of the New Bell Grant Exchange at Pittsburgh. Photograph by the Pittsburgh Industrial Development Commission.

The Operator and Her Work

Read before Joint Sections A. I. E. E., N. E. L. A. and Oregon Society of Engineers at Portland

BY J. H. CORCORAN

THE subject I have elected to discuss is that of the Telephone Operator and Her Work, because, while associated with telephone companies for many years, I have been directly associated with the work of improving central office operating practices and methods, and the training and supervision of central office operators, for the past eight years.

As you are aware, the telephone and the telephone switchboard were not invented simultaneously. The first telephone consisted only of what we now term the "receiver," and when used, these were connected in pairs, that is, one receiver was placed on one end of the line and another receiver on the other end.

It became apparent with the additions to the private lines that some sort of a switching device was required so that one line could be connected with another. Telephone history, I believe, credits a Mr. Holmes, Jr., of Boston, with putting in use the first telephone switchboard. Mr. Holmes' father operated a burglar alarm system which had wires to the principal banks in the city, and young Holmes found that by putting a telephone on each of these circuits and tying the terminals of the burglar alarm circuits together with a piece of wire, the telephones would be connected. This while a very crude arrangement, was really the birth of a new idea in the business world.

In a short time it was found that the switchboard used by the telegraph companies was adaptable for telephone use, and the first commercial switchboards were of this type. The usual plan of operation for the central office then was this: A switchboard of the telegraph type was built on one side of the room. On the other side of the room registers containing paper tape were placed. On the subscriber's premises was placed a telephone consisting of a receiver, a vibrating bell and a call box of the same type then and now used by messenger companies. To the subscriber's premises were built two lines; one, his telephone line, and the other, the circuit on which the call box was located, there being many of these call boxes on one circuit. To signal the central office, the subscriber pulled the lever on the call box. This caused the call to be recorded on the paper tape at the central office. A boy would read the record on the paper tape and call across the room to another boy to answer a particular subscriber. The boy operator would then take a cord and plug into the jack of this subscriber, and after obtaining the number would establish connection on the board.

In the larger offices, (and you must remember that there was no multiple in those days) the switchboards were from twenty-five to thirty feet long, and the cords were correspondingly as long. They were termed the "Cord and Reel" in those days, as the cord wound up on a reel by spring pressure.

It is certain that when several calls were being received about the same time, what with the calling of numbers across the room and the boys racing madly from one end of the board to another to complete these connections, the central office was not a quiet, restful place.

As the systems grew, the confusion became greater and greater, but in the meantime developments were being made in the switchboard; the carbon transmitter was being brought into use; and gradually the loud-voiced boy was being replaced by the soft-voiced, deft-fingered girl. It is true that in these earlier days, the girl operators did not receive any particular training. The boards were comparatively simple, and the calls were few. However, as the system grew, the need of training operators

carefully for the work was apparent.

The telephone companies in the larger cities today provide well-equipped training schools for their operating forces. An applicant for a position as operator has her eyesight tested, her enunciation noted, must have a good grammar school education, and must impress the school principal as being a person who will not discredit other members of the operating force.

After a girl has been accepted as a student—and I wish to call to your attention that in this city of Portland only one in six of all applicants are accepted in the operating school, and it must not be understood that every applicant graduates from the operating school, because even after acceptance, it may be found that some feature or mannerism renders the girl unfitted for telephone work—after a girl has been accepted as a student, she is placed in our training school for a four weeks' instruction in the handling of telephone calls. Remember that this four weeks is simply a preliminary training for the student. The schools are provided with competent instructors, are equipped with individual desks, with a standard multiple switchboard, and special apparatus so that the instructors can originate calls which the students will answer, and complete in the multiple board. A course of study is provided so that during eight hours of each working day of these four weeks the student is either engaged in handling calls originated by the instructors, is reading the explanation and instruction covering the handling of calls from her study books, or in class is listening to an instructor going over the details of the lessons they have been studying.

When the student graduates from the school—and she is not permitted to graduate until she is letter-perfect in the handling of a call under all conditions, and there are many, many conditions which surround a call which the operator must learn—she is sent to a central office. At the central office she is still not permitted to complete calls from the public, but listens in with an experienced operator and one who has been selected for this purpose, due to her particular fitness for assisting the newer girls. After she has been in the central office a sufficient number of days to permit her to become accustomed to her surroundings, she is permitted to answer calls from subscribers, but still under the care of a senior operator who is listening in with her. Her progress is rapid from this time on, and in a comparatively short time she is permitted to answer calls alone. The newer operators, however, are kept at the less busy positions, as it can be understood that the rapidity with which they can handle connections safely and accurately is controlled by their experience. At the end of eighteen months, the operator may be considered as experienced.

It will be seen, therefore, that the telephone companies, in order to render the most efficient service possible to the subscriber, have kept continually at the developing of the switchboard in order to reduce the time period required to establish connection, and in step with this, have trained their operators in a manner so that the public does not have to bear the burden of inexperience, but this latter is removed, as far as is possible, at the training schools.

In the City of Portland, we have 650 operators. It must be remembered that all of these 650 operators are young women who have been selected for their work. As I have said before, only one applicant in six is accepted for the work, so that here we have a force which has been selected from over 4,000 applicants.

It must be seen therefore that in the telephone work we have the highest type of young woman that is in the business world today. Her clients, however, demand exacting attention. They will not stand in line as they do in the theater, or the store, or the barber shop, and await their turn, but demand instant attention. They are in a hurry—that is the reason they are using the telephone—and every second seems a minute long, and any apparent neglect or wrong number is taken as a personal affront by the subscriber. As a matter of fact, the telephone girl in America today has become so efficient that we expect her to be a paragon of perfection. Such complaints as she may get she bears patiently, as she knows very frequently that the wrong number complained of really was called by a subscriber who made a mistake and learned it when the called subscriber answered, but would not acknowledge it and let the called subscriber assume the operator was at fault.

A great deal of her trouble is due to the improper method of talking into telephone transmitters. In the old days, when they had a receiver which they used as both a receiver and transmitter, it is said the companies found it necessary to furnish the subscribers with a notice reading: "Do not try to talk with your ear or listen with your mouth." Today many of the subscribers properly listen with their ears, but they do not talk with their mouths anywhere near the transmitter. The result is that the operator frequently has to ask a second time for the number. If you want to be considered a friend of the central office operator, do what you can to have the public talk into the telephone, and not at it.

We who associate with the central office operator admire and respect her. We know of her courage, and you have frequently read, no doubt, in the public press, of some telephone operator who has stuck by her post in the face of an advancing flood, or other calamity, warning her subscribers of the danger. I have been in a central office in a large city where the operating rooms were covered by an immense glass skylight. When the building adjoining took fire, the flames went across the glass skylight, cracking the glass and filling the room with smoke, but the operators stuck to their post, attempting to handle the tremendous number of calls occasioned by the fire which was quite a spectacular one. I have been in a tall building in an operating room when the city was shaken by an earthquake. My inclination was to run for the door. The operators, however, remained at the board, a little pale, perhaps, but ready for the great number of calls which they knew would follow the shake.

During the last sleet storm, when transportation was at a standstill in the city of Portland, some of our operators waded through snow several miles to get to the central office to help in handling the heavy traffic they knew would have to be handled at such a time. They knew that they would not be criticised for failing to report to the office at such a time, but they wanted to do their part in giving the public service.

Can you wonder that I, who know what these young women are doing every day, appreciate the opportunity of telling you the part that the telephone operator plays in the telephone world? And this reminds me of another phase of telephone operating which is not in the central office, and over which the telephone company has no control, and that is the operating of private branch exchanges.

The private branch exchange operator in many business houses, and probably in most, guards the entrance through which the greater volume of the business of the firm is done. Notwithstanding the importance of the position, however, I have known girls who were rejected by the telephone company as not fitted for telephone work, being placed in a private exchange position simply on the statement that she had at some time been engaged in telephone work, or had at some time been engaged in private branch exchange work. The young lady, in applying for the work, is not intentionally misrepresenting, but, as a matter of fact, does not know the requirements of the position. This is a matter strictly up to the employer, and he should use the same care in selecting a person for this position that he would for any other responsible position in his business.

During the late night or early morning hours, when a big fire visits a city, you will find telephone operators hastening to the nearest central office to help out the night operators. They do this of their own initiative, as we could not and would ask them to do it; but it does indicate the general desire of the operators to do their level best to serve the public.

I want you to think over this: Is the private branch exchange operator at your subscriber's place of business trained for her work? Has as much attention been given to training her to handle her work as the telephone company has given to the training of its central office operators to handle their subscribers' work?

May Install Telautograph in Senate

Experiments are being made in Washington to ascertain if it would be possible to install in the Senate a telautograph system, or something similar to it, electrically operated, to inform senators while in their offices what is going on in the Senate chamber, says the *Electrical World*. Under the present system of informing senators what is going on in the Senate chamber, a series of call bells, ringing from one to five, announces to them that a roll-call is then being demanded, or that no quorum is present, or other similar information. Under the proposed system, a clerk at the reading desk of the Senate, or beneath the chair of the presiding officer, would record upon an electrical device similar to the so-called telautograph what is actually happening on the floor of the Senate, such as "Senator So-and-so" is wanted on the floor, "The army appropriation bill is now up for debate," etc. The old-fashioned call-bell system, which means the loud ringing of a gong, with only five indications of what is transpiring in the Senate chamber, is felt by some of the younger senators to be out of date and not sufficiently indicative.

Sunny on State Ownership

Public utiltities in the hands of private owners and stockholders spread over wide area are, according to B. E. Sunny, president of the Chicago Telephone Company, safer, sounder, and more efficient than if they were in the hands of the federal government, the state, or the municipality. Mr. Sunny talked on general conditions in the bond markets before the Bondmen Club, at the University Club.

Government ownership of railways has proved itself a failure in the conduct of the postoffice, he said. He cited the pork barrel methods of the congressmen, and told of various legislative abuses.

Figures and records were given to show that cities of very small populations had been given tremendous appropriations through the recommendations of the rivers and harbors committee, and he told of one town of less than 5,000 which had been given a postoffice costing $60,000, when a $5,000 structure would be adequate for its needs.

"Think of the grand chain of railway stations the country might have if the railways were run by the government," said Mr. Sunny.

He advised leaving well enough alone. To strengthen his argument that things were in good shape as they now stand, he told the story of the man who had taken the coo-coo clock to pieces in order to see its mechanism and then put it together again after much care and patience and perspiration. He had put every piece in its proper place but the bird, instead of saying its coo-coo in its former fashion, reversed the inflections.

"You can well imagine that the same result would follow if the government took over the railways," he said. "Instead of the usual telephonic greeting of 'Hello' it might easily be a word that sounds like 'Hello' reversed.

The government, continued Mr. Sunny, is anxious to absorb things in order that the cost of the nation's living might be reduced. He cited the 75 per cent rise in the price of eggs as proof of the fact that the hen should be regulated by the government, because she is so notorious for her irregularity and inefficiency.

"Why not a government regulation placing the limit of production for the hen at 200 eggs a year instead of the uncertain output of the present time?" he asked.

"One of the worst results of the campaign against the corporations," he said, "was the putting of the government into commerce. Through its most recent marine legislation the government has killed, practically, international shipping, the parcels post has ruined the express business, and now the government is building its own railway in Alaska."

South Dakota Independents Meet

The convention of the South Dakota Independent Telephone Association chose Watertown for its next annual meeting.

Re-election of officers, choosing of Watertown as the 1918 convention city and discussion of the legislative program which they hope to push, close the 1917 convention of the Independent Telephone Association, representing Independent telephone men from over the northwest. Officers elected are: J. A. Steninger of Parker, president; B. M. Ran, vice-president, and A. S. Hail of Redfield, secretary.

New Bell Combination

The Southwestern Bell Telephone Company, a new $50,000,000 Missouri corporation, which will make St. Louis its headquarters, is taking over and consolidating all of the Bell Telephone properties of Missouri, Kansas, Arkansas and Oklahoma.

An application, asking for the approval of the proposed sale and consolidation, was filed with the Public Service Commission at Jefferson City by John M. Atkinson, former chairman of the commission, and the application has been approved.

According to the application the Missouri and Kansas Telephone Company pays $10,000,000 for the Southwestern Telegraph and Telephone Company of St. Louis and $7,500,000 for the stock, but not for the physical properties, of the Pioneer Telephone Company of Oklahoma. Both purchases are paid for in stock of the new corporation. The new corporation gives its note for $6,000,000 due in one year for the Southwestern Telegraph and Telephone Company of New York, which operates in Arkansas.

The new corporation was granted authority by the Public Service Commission to increase its capital from $20,000,000 to $50,000,000. Of this amount $31,127,700 will be issued.

The Southwestern Bell Telephone Company takes over all of the physical properties of the old companies, together with the obligations outstanding against them.

The volume of business which is increasing rapidly was the primary cause of the move.

"The aggregate income of all the consolidated properties will be somewhere between $12,000,000 and $15,000,000, and we felt that such a tremendous volume of work could be expedited through the management of one corporation," E. D. Nims of the company stated.

"Then, too, it is much easier to finance the work of one large and dependable corporation than it is to look after the financing of several small ones. Unless all predictions go awry, the new corporation will grow very rapidly.

"The reason that the new corporation saw fit to select Missouri and St. Louis for its headquarters is because of its faith in the promises of Col. Frederick D. Gardner that, as governor, he would give the state a business administration.

"The present main offices of the different companies will remain where they are, and, through them, the business of the new corporation will be directed from the St. Louis headquarters. There will be no changes in managerial or administrative officers.

"The new corporation expects to spend several millions of dollars in improving the physical properties of the corporation in Missouri during 1917."

New Companies Still Interest Iowa

The Farmers and Merchants Telephone Company, owner of a string of telephone exchanges around Pocahontas, Iowa, has stirred up some excitement and the result may be another telephone company.

Last summer all farm line subscribers were notified rates would be raised unless paid quarterly in advance. A mass meeting was held and a committee appointed to confer with the telephone company, but they refused to confer.

The first of the year all town subscribers were notified rates had been advanced, subject to the same conditions.

A meeting of the committee was called and the company notified of the meeting. At first it refused to send representatives but when the committee met three officials of the company were on hand.

After a session in which matters were freely discussed, the committee demanded no advance in rates, better service, and free toll service in the county.

Unless these demands are granted the public committee says, steps will be taken to organize a new company and put in a system over the whole county.

Sunset Absorbs Riverside

Another step in the proposed consolidation of Riverside, California's, two telephone systems was taken when the state railroad commission, meeting at San Francisco, authorized the Pacific company to acquire the entire capital stock of the Riverside Home Telephone Company.

The Pacific company has already purchased all the bonds of the Home company to the value of $275,000, having paid for them $168,253.44. With the acquiring of the capital stock of the Home company, the Pacific Telephone Company will have become complete owners of the local company.

It is expected that a force of men will be immediately put to work at Riverside uniting the two systems. As yet nothing towards actual consolidation has been done, except the making of preliminary survey of the two plants. Officials of the Pacific company pany stated today that work has been held up pending the decision of the railroad commission as to the capital stock.

It is expected that the two sysems will be united by March 1.

Omaha Gets Tall Telephone Building

The Nebraska Telephone and Telegraph Company's building at Nineteenth and Douglas streets, Omaha, may be nineteen or twenty stories.

While it originally was planned to make the building fifteen stories and contracts for steel have been let on this basis, but since officials of the company have considered raising it, and engineers of the company, now in the east, may increase the order.

This building will cost approximately $500,000.

Dakota Rurals Under One Head

A movement has been inaugurated by some of the stockholders of rural telephone lines of South Dakota connecting with the Garretson system for the consolidation of all lines under one head, the Garretson company to be the parent system of the other lines. It is believed there will be better service under one management. A meeting of the stockholders of the various lines will be held in the near future, at which it is thought some arrangement may be made for the consolidation of all the lines under one management.

Bill for Municipal Ownership

Alderman Coughlin of Chicago's First ward introduced an order calling upon the corporation counsel to draft a bill to be submitted to the state legislature authorizing the city to own and operate the Automatic Telephone Company. The franchise of the Automatic Telephone Company recently was declared forfeited.

Growth and Depreciation

Presented at the 326th Meeting of the American Institute of Electrical Engineers, New York

BY JULIAN LOEBENSTEIN

It is generally assumed that a complex utility property will depreciate to an approximately fixed per cent condition. This is shown by theoretical and actual curves to be incorrect. It is shown that the manner of the company's growth affects its per cent condition.

The necessity for reserves, the manner in which they may be kept and the return which should be allowed on them, whether reinvested or not, is discussed. Several Commission and Court decisions are quoted to show the tendency to disallow a return on a reserve and arguments are presented in refutation of the decisions.

The principal points are as follows:

1. The condition of a property is dependent not only on maintenance but also on its growth.

2. Property does not settle down to a fixed per cent condition.

3. Capital is kept intact by reinvesting reserve in extensions. Under this condition, depreciated value of the entire property is the fair one for rate making purposes.

4. For a company unable to use reserve in extensions a liquid depreciation fund will be necessary.

5. The same return, available for dividends, should be allowed on a reserve as on the remainder of the property.

IN this article the writer tries to bring out the following points:

First, to show that the per cent condition of any property is dependent not only upon the maintenance, but upon the past and present growth.

Second, to show that under practically no condition will it be necessary to bring a property back to one hundred per cent condition, but that it does not settle down to some fixed per cent condition less than one hundred per cent. It does, however, go through a repeating cycle of conditions, one point in the cycle being a maximum above which it will never rise. This maximum point will depend entirely upon the growth of the property and should be studied separately for each property under consideration.

Third, to show that under certain conditions of growth, a growing company need keep no liquid depreciation reserve fund; that it may reinvest the reserve in extensions, making renewals as they come due in any given year, from the amount set aside for depreciation reserve in that year, and that by so doing the stockholders' capital is kept intact, yet the depreciated value of the whole property is the fair one, both for consumer and stockholder, for rate-making purposes.

Fourth, to show that for a company which has stopped growing or for one which is growing at a rate not large enough to use all of the depreciation reserve for reinvestment in extensions, it will be necessary to have a continually varying amount in a liquid depreciation reserve fund, and that this amount will fluctuate in a manner depending upon the company's growth.

Fifth, to show that since such a liquid reserve may be necessary for a growing company and will be necessary for a company which has ceased to grow, that the same return should be allowed on such a reserve as on any other capital invested in the property, and that such return should be available for dividends, provided that the cost new, less depreciation, is to be used as a basis for making the rates.

The following definitions and assumptions are made in the discussion. By liquid depreciation reserve fund is meant a reserve either as cash in a bank, invested in bonds or employed in any other way so as to be readily convertible into cash for immediate use. This is to distinguish it from depreciation reserve, which is invested in extensions and betterments and which cannot be readily turned into available cash. No consideration is taken of scrap value nor of a reserve for emergencies or catastrophies as the calculations are not in any way affected by such a fund, the effect being simply to refer them to a different ordinate. All calculations are on the straight line basis and all properties considered are assumed to be kept in the best state of repair. It is assumed that the depreciated value of the property will be used as a basis for making the rates.

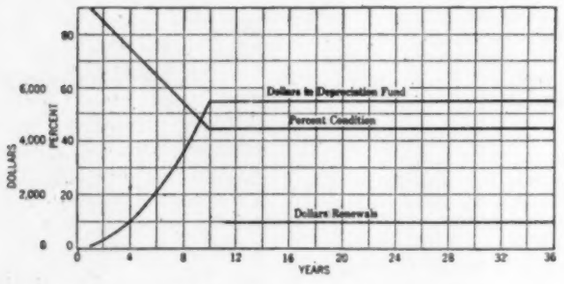
Before attempting to draw any conclusions from the tables, it is advisable to show how they were constructed and calculated. Table I is the calculation for a property in which a uniform capital investment of $1,000 a year is made for ten years and the property then stops growing. All the elements of the property are assumed to have a ten-year life. Table II shows a property similar in all respects but one, to that shown in Table I. In Table II the uniform investment is made for only five years of the ten. Table III is for a property the elements of which have a ten-year life. In the first year the capital investment is $1,000. In the second year the depreciation fund is used for investment in extensions and enough additional capital is invested to bring the investment of both capital and reserve for the year up to $1,000. The same procedure is followed each year until at the end of the tenth year the property ceases to have any further additions. Table IV is for a property the elements of which have a ten-year life. Starting with an investment of $1,000 the first year, the investment decreases one hundred dollars per year until the tenth year, at which time the property stops growing. The depreciation reserve is not reinvested. Table V shows a property consisting of two life groups having lives of ten and twenty years respectively. Starting with a capital investment of five hundred dollars for each of the groups, the capital investment is increased one hundred dollars a year for each group for the ten years. In each year an equal amount has been reinvested in each life group, so that the total of such investments for any given year is nearly equal to the amount set aside in the depreciation reserve the year before. This continues up to and including the tenth year, after which time further investments are discontinued, but renewals are made as each portion of the original investment reaches the end of its life.

It may be well here to point out something worthy of note which developed in the course of the calculation. It will be seen, by reference to Table V, that in every case ,the sum of dollars remaining in the fund (column 15) and the depreciated value of the property (column 17) giving (column 18) the total value of the property is the same as the total capital expenditure (column 6). This furnishes a short method of calculating the depreci-

TABLE I.

UNIFORM YEARLY INVESTMENT FOR TEN YEARS.
End of growth—Tenth year.
Life—Ten years.
Depreciation reserve not invested in extensions.

End of year	Capital invest. for the year	Total capital expenditures	Increment to depr. fund	Deduction from depr. fund	Total in depr. fund	Percent condition
1	1,000	1,000	100	0	100	90
2	1,000	2,000	200	0	300	85
3	1,000	3,000	300	0	600	80
4	1,000	4,000	400	0	1,000	75
5	1,000	5,000	500	0	1,500	70
6	1,000	6,000	600	0	2,100	65
7	1,000	7,000	700	0	2,800	60
8	1,000	8,000	800	0	3,600	55
9	1,000	9,000	900	0	4,500	50
10	1,000	10,000	1,000	0	5,500	45
11	.....	10,000	1,000	1,000	5,500	45
12	.....	10,000	1,000	1,000	5,500	45
13	.....	10,000	1,000	1,000	5,500	45
14	.....	10,000	1,000	1,000	5,500	45
15	.....	10,000	1,000	1,000	5,500	45
16	.....	10,000	1,000	1,000	5,500	45
17	.....	10,000	1,000	1,000	5,500	45
18	.....	10,000	1,000	1,000	5,500	45
19	.....	10,000	1,000	1,000	5,500	45
20	.....	10,000	1,000	1,000	5,500	45

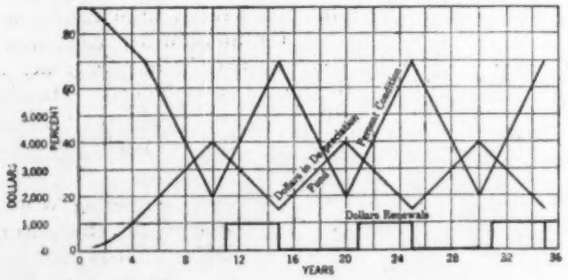


Curve I.—Uniform Investment for Ten Years.
End of growth, tenth year—life, ten years—depreciation reserve not invested in extensions.

TABLE II.

Uniform yearly investment for five years.
End of growth—Fifth year.
Life—Ten years.
Depreciation reserve not invested in extensions.

End of year	Capital invest. for the year	Total capital expenditures	Increment to depr. fund	Deduction from depr. fund	Total in depr. fund	Percent condition
1	1,000	1,000	100	0	100	90
2	1,000	2,000	200	0	300	85
3	1,000	3,000	300	0	600	80
4	1,000	4,000	400	0	1,000	75
5	1,000	5,000	500	0	1,500	70
6	.....	5,000	500	0	2,000	60
7	.....	5,000	500	0	2,500	50
8	.....	5,000	500	0	3,000	40
9	.....	5,000	500	0	3,500	30
10	.....	5,000	500	0	4,000	20
11	.....	5,000	500	1,000	3,500	30
12	.....	5,000	500	1,000	3,000	40
13	.....	5,000	500	1,000	2,500	50
14	.....	5,000	500	1,000	2,000	60
15	.....	5,000	500	1,000	1,500	70
16	.....	5,000	500	0	2,000	60
17	.....	5,000	500	0	2,500	50
18	.....	5,000	500	0	3,000	40
19	.....	5,000	500	0	3,500	30
20	.....	5,000	500	0	4,000	20

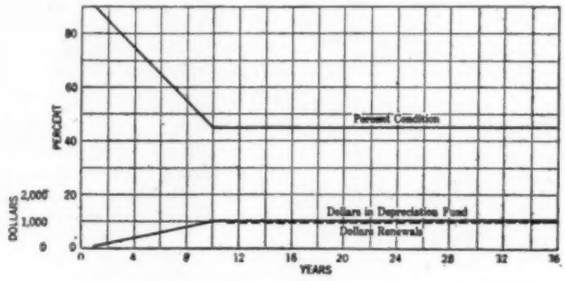


Curve II.—Uniform Yearly Investment for Five Years.
End of growth, fifth year—life, ten years—depreciation reserve not invested in extensions.

TABLE III.

Uniform yearly investment for ten years.
End of growth—Tenth year.
Life—Ten years.
Depreciation reserve invested in extensions.

End of year	Capital invest. for the year	Total capital expenditure	Investment for the year from depr. reserve	Total investment capital plus reserve	Increment to depr. fund	Deduction from depr. fund	Total in depr. fund	Percent
1	1,000	1,000	...	1,000	100	....	100	90
2	900	1,900	100	2,000	200	100	200	85
3	800	2,700	200	3,000	300	200	300	80
4	700	3,400	300	4,000	400	300	400	75
5	600	4,000	400	5,000	500	400	500	70
6	500	4,500	500	6,000	600	500	600	65
7	400	4,900	600	7,000	700	600	700	60
8	300	5,200	700	8,000	800	700	800	55
9	200	5,400	800	9,000	900	800	900	50
10	100	5,500	900	10,000	1,000	900	1,000	45
11	...	5,500	...	10,000	1,000	1,000	1,000	45
12	...	5,500	...	10,000	1,000	1,000	1,000	45
13	...	5,500	...	10,000	1,000	1,000	1,000	45
14	...	5,500	...	10,000	1,000	1,000	1,000	45
15	...	5,500	...	10,000	1,000	1,000	1,000	45
16	...	5,500	...	10,000	1,000	1,000	1,000	45
17	...	5,500	...	10,000	1,000	1,000	1,000	45
18	...	5,500	...	10,000	1,000	1,000	1,000	45
19	...	5,500	...	10,000	1,000	1,000	1,000	45
20	...	5,500	...	10,000	1,000	1,000	1,000	45

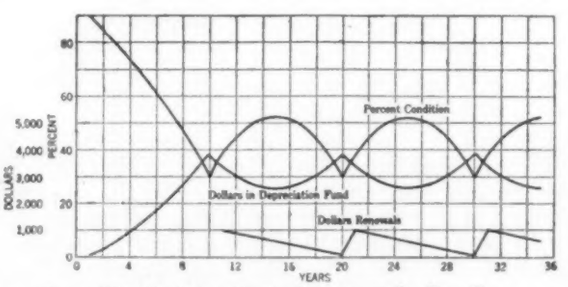


Curve III.—Uniform Yearly Investment for Ten Years.
End of growth, tenth year—life, ten years—depreciation reserve invested in extensions.

TABLE IV.

Decreasing yearly investment for ten years.
End of growth—Tenth year.
Life—Ten years.
Depreciation reserve not invested in extensions.

End of year	Capital invest. for the year	Total capital expenditure	Increment to depr. fund	Deduction from depr. fund	Total in depr. fund	Depreciated value of property	Percent condition
1	1,000	1,000	100	...	100	900	90.0
2	900	1,900	190	...	290	1,610	84.6
3	800	2,700	270	...	560	2,140	78.3
4	700	3,400	340	...	900	2,500	73.6
5	600	4,000	400	...	1,300	2,700	67.5
6	500	4,500	450	...	1,750	2,750	61.0
7	400	4,900	490	...	2,240	2,660	54.3
8	300	5,200	520	...	2,760	2,440	47.0
9	200	5,400	540	...	3,300	2,100	38.9
10	100	5,500	550	...	3,850	1,650	30.0
11	...	5,500	550	1,000	3,400	2,100	38.2
12	...	5,500	550	900	3,050	2,450	44.5
13	...	5,500	550	800	2,800	2,700	49.1
14	...	5,500	550	700	2,650	2,850	51.7
15	...	5,500	550	600	2,600	2,900	52.8
16	...	5,500	550	500	2,650	2,850	51.7
17	...	5,500	550	400	2,800	2,700	49.1
18	...	5,500	550	300	3,050	2,450	44.5
19	...	5,500	550	200	3,400	2,100	38.2
20	...	5,500	550	100	3,850	1,650	30.0



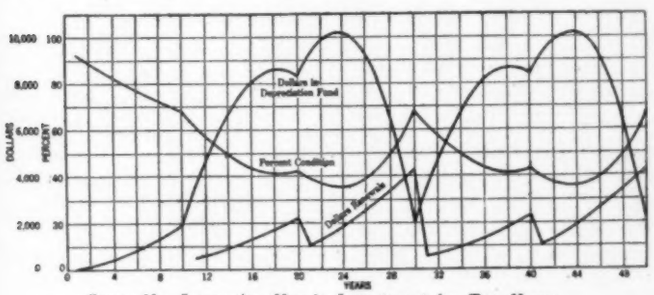
Curve IV.—Declaring Yearly Investment for Ten Years.
End of growth, tenth year—life, ten years—depreciation reserve not invested in extensions.

ated value of the property, i. e., by subtraction instead of by the depreciation of each year group. Take, for example, the tenth year: the long method is:

Dollars	*Per cent remaining value*	*Dollars remaining value*
500	0	0.00
500	50	250.00
630	10	63.00
630	55	346.50
790	20	158.00
790	60	474.00
940	30	282.00
940	65	611.00
1100	40	440.00
1100	70	770.00
1300	50	650.00
1300	75	975.00
1500	60	900.00
1500	80	1200.00
1700	70	1190.00
1700	85	1445.00
1950	80	1560.00
1950	90	1755.00
2150	90	1935.00
2150	95	2042.50
		$17,047.00

This $17,047, the depreciated value of the property, as obtained above, plus $1,953, the dollars in the depreciation fund, is equal to the total capital expenditure of $19,000. The short method is, therefore, to subtract the dollars in the depreciation fund from the total capital expenditure to get the depreciated value of the property. This method was followed in the calculation of the table.

It is generally considered that a property maintained in good operating condition will be between 70 and 85 per cent new. In fact, Whitten, in his Valuation of Public Service Corporations, discussing depreciation, says (Vol. I, page 358, par. 421): "It has been stated that a street railway maintained in good operating condition will necessarily show cost less depreciation of from 70 to 85 per cent of the cost new." That this is an entirely fallacious assumption and that the per cent condition of any property is not only a function of its maintenance, but also most decidedly of the manner of its growth, is shown by the accompanying tables and curves.

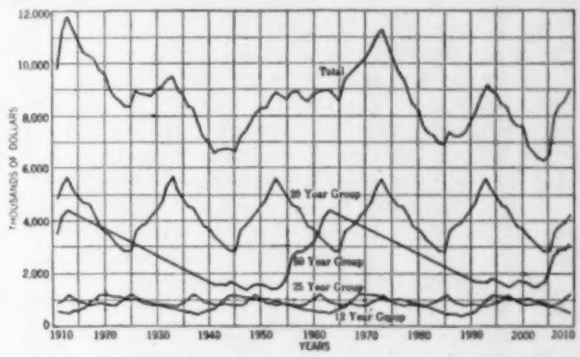


Curve V.—Increasing Yearly Investment for Ten Years.

Life { *one group, ten years.* / *one group, twenty years.*

End of growth, tenth year—depreciation reserve invested in extensions.

It is now an easy matter to prove that Mr. Whitten's assumption is wrong, and also to prove the first point, which is that the per cent condition of any property is dependent not only on the maintenance, but upon the past and present growth. Referring to the tables, we see that in Table I and Curve 1, where there has been a uniform investment over a term of years corresponing to the life of the property, the per cent condition varies from 90 to 45 during that term, and then stays at 45 when the property stops growing. The per cent condition appears as 45 instead of the proverbial 50 because, in the calculations, the end, instead of the beginning of the tenth year is considered. In Table II and Curve II, where there is a uniform investment over a term of years not corresponding to the life of the property, the per cent condition varies from 90 to 70, while the property is growing. After that it varies in repeating cycles from 70 to 20 and back to 70 again. This, of course, is an extreme case, but it shows the possibilities of variation. Table III and Curve III show the same characteristics as Table I, although in Table I there is no reinvestment of reserve, while in Table III there is. Table IV and Curve IV show a more complicated property than the others. Here the variation during the ten years the property is expanding, is from about 92 to about 67. It then goes through a repeating cycle whose period is twenty years, varying from 67 to 35 per cent and back again.



Curve VI.—Depreciated Service Values of an Actual Property.

End of growth assumed Dec. 31, 1913—original service value $16,500,000—maximum per cent condition 69.0 per cent—minimum per cent condition 37.5 per cent.

Thus it may readily be seen that a company which grows at an increasing rate will have a lower per cent depreciation in any given year, than a company which grows at a uniform rate, all other conditions being assumed the same. Furthermore, if both companies reach their maximum growth at the same time thereafter their per cent condition will vary one from the other; first, because of the discrepancies between the terms over which the investments have been made and the life terms of the groups (compare Tables and Curves I and III) and second, because of the dissimilar manner in which the investments have been made (compare Tables and Curves IV and V).

Moreover this is borne out not only by the theoretical calculation, but Curve VI shows this condition for an actual electric property. The company was assumed to have reached its final growth on December 31, 1913, after which date only renewals were made. The total service value of all the property was approximately $16,500,000 yet it may be seen from the curve that the actual service value varies from $6,200,000 to $11,000,000 or from 37.5 per cent to 69 per cent. Now, even supposing that some of the assumptions as to probable life are incorrect, the property will still vary over a wide range and not be in any popularly supposed fixed condition somewhere between 70 and 85 per cent. Curve VIII is for another actual property but a much smaller one than that considered in Curve VI. The property is assumed to reach its full growth in 1912, and the remaining service value is shown for the next 53 years. The service value varies from $810,000 to $370,000 or a corresponding per cent variation from 77 to 35.

Before passing to point two, it is pertinent to quote again from Whitten, who says, (Vol. 2, page 1127, par. 1285). "We know, however, that there is a tendency for

TABLE V.

Increasing Yearly Investment for Ten Years.
Life { One Group Ten Years. / One Group Twenty Years.
End of Growth Tenth Year.
Depreciation Reserve Invested in Extensions.

End of Year No. 1	Capital investment for the year: 10 year life group No. 2a	Capital investment for the year: 20 year life group No. 2b	Investment for the year from depr. fund: 10 year life group No. 3a	Investment for the year from depr. fund: 20 year life group No. 3b	Renewals: 10 year life group No. 4a	Renewals: 20 year life group No. 4b	Total capital expenditure: 10 year life group No. 5a Sum of No. 2a's	Total capital expenditure: 20 year life group No. 5b Sum of No. 2b's	Total capital expenditure both groups No. 6 No. 5a+ No. 5b	Total investment from depr. fund: 10 year life group No. 7a Sum of No. 3a's	Total investment from depr. fund: 20 year life group No. 7b Sum of No. 3b's	Grand total expenditure for either 10 or 20 year group No. 8 No. 5a+ No. 7a	Grand total expenditure on property exclusive of renewals No. 9 2×No. 8
1	500	500	...	...	...	...	500	500	1,000	30	30	500	1,000
2	600	600	30	30	...	...	1,100	1,100	2,200	120	120	1,130	2,260
3	700	700	90	90	...	...	1,800	1,800	3,600	260	260	1,920	3,840
4	800	800	140	140	...	...	2,600	2,600	5,200	460	460	2,860	5,720
5	900	900	200	200	...	...	3,500	3,500	7,000	760	760	3,960	7,920
6	1,000	1,000	300	300	...	...	4,500	4,500	9,000	1,160	1,160	5,260	10,520
7	1,100	1,100	400	400	...	...	5,600	5,600	11,200	1,660	1,660	6,760	13,520
8	1,200	1,200	500	500	...	...	6,800	6,800	13,600	2,310	2,310	8,460	16,920
9	1,300	1,300	650	650	...	...	8,100	8,100	16,200	3,060	3,060	10,410	20,820
10	1,400	1,400	750	750	...	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
11	...	...	...	...	500	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
12	...	...	...	...	630	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
13	...	...	...	...	790	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
14	...	...	...	...	940	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
15	...	...	...	...	1,100	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
16	...	...	...	...	1,300	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
17	...	...	...	...	1,500	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
18	...	...	...	...	1,700	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
19	...	...	...	...	1,950	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
20	...	...	...	...	2,150	...	9,500	9,500	19,000	3,060	3,060	12,560	25,120
21	...	...	...	...	500	500	9,500	9,500	19,000	3,060	3,060	12,560	25,120
22	...	...	...	...	630	630	9,500	9,500	19,000	3,060	3,060	12,560	25,120
23	...	...	...	...	790	790	9,500	9,500	19,000	3,060	3,060	12,560	25,120
24	...	...	...	...	940	940	9,500	9,500	19,000	3,060	3,060	12,560	25,120
25	...	...	...	...	1,100	1,100	9,500	9,500	19,000	3,060	3,060	12,560	25,120
26	...	...	...	...	1,300	1,300	9,500	9,500	19,000	3,060	3,060	12,560	25,120
27	...	...	...	...	1,500	1,500	9,500	9,500	19,000	3,060	3,060	12,560	25,120
28	...	...	...	...	1,700	1,700	9,500	9,500	19,000	3,060	3,060	12,560	25,120
29	...	...	...	...	1,950	1,950	9,500	9,500	19,000	3,060	3,060	12,560	25,120
30	...	...	...	...	2,150	2,150	9,500	9,500	19,000	3,060	3,060	12,560	25,120

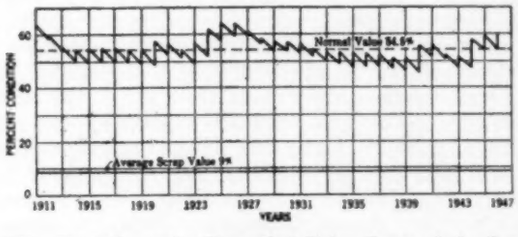
End of Year	Total expenditure for the year: 10 year life group No. 10a No. 2a+ No. 3a	Total expenditure for the year: 20 year life group No. 10b No. 2b+ No. 3b	Increment to depr. fund for the year: 10 year life group No. 11a No. 8 / 10	Increment to depr. fund for the year: 20 year life group No. 11b No. 8 / 20	Total increment for the year to depr. fund No. 12 No. 11a+ No. 11b	Deduction for the year from depr. fund: for extensions No. 13a No. 3a+ No. 3b	Deduction for the year from depr. fund: For renewals No. 13b No. 4a+ No. 4b	Difference No. 14 No. 12— No. 13	Total remaining in depr. fund No. 15 No. 12+ No. 14	Per cent condition No. 16 No. 17 / No. 9 ×100	Depreciated value of the property No. 17 No. 6—No. 15	Total value of the property No. 18 No. 15+No. 17
1	500	500	50.	25.00	75.00	...	...	+ 75.00	75.00	92.5	925.00	1,000
2	630	630	113.	56.50	169.50	60	...	+ 109.50	184.50	89.0	2,015.50	2,200
3	790	790	192.	96.00	288.00	180	...	+ 108.00	292.50	85.8	3,307.50	3,600
4	940	940	286.	143.00	429.00	280	...	+ 149.00	441.50	83.0	4,758.50	5,200
5	1,100	1,100	396.	198.00	594.00	400	...	+ 194.00	635.50	80.4	6,364.50	7,000
6	1,300	1,300	526.	263.00	789.00	600	...	+ 189.00	824.50	77.8	8,175.50	9,000
7	1,500	1,500	676.	338.00	1,014.00	800	...	+ 214.00	1,039.50	75.1	10,160.50	11,200
8	1,700	1,700	846.	423.00	1,269.00	1,000	...	+ 269.00	1,307.50	72.5	12,292.50	13,600
9	1,950	1,950	1,041.	520.50	1,561.50	1,300	...	+ 261.50	1,569.00	70.3	14,631.00	16,200
10	2,150	2,150	1,256.	628.00	1,884.00	1,500	...	+ 384.00	1,953.00	67.8	17,047.00	19,000
11	....	....	1,256.	628.00	1,884.00	....	500	+ 1,384.00	3,337.00	62.4	15,663.00	19,000
12	....	....	1,256.	628.00	1,884.00	....	630	+ 1,254.00	4,591.00	57.3	14,409.00	19,000
13	....	....	1,256.	628.00	1,884.00	....	790	+ 1,094.00	5,685.00	53.0	13,315.00	19,000
14	....	....	1,256.	628.00	1,884.00	....	940	+ 944.00	6,629.00	49.3	12,371.00	19,000
15	....	....	1,256.	628.00	1,884.00	....	1,100	+ 884.00	7,513.00	45.8	11,487.00	19,000
16	....	....	1,256.	628.00	1,884.00	....	1,300	+ 584.00	8,097.00	43.6	10,913.00	19,000
17	....	....	1,256.	628.00	1,884.00	....	1,500	+ 384.00	8,481.00	42.0	10,519.00	19,000
18	....	....	1,256.	628.00	1,884.00	....	1,700	+ 184.00	8,665.00	41.0	10,335.00	19,000
19	....	....	1,256.	628.00	1,884.00	....	1,950	— 66.00	8,599.00	41.8	10,401.00	19,000
20	....	....	1,256.	628.00	1,884.00	....	2,150	— 266.00	8,333.00	42.3	10,667.00	19,000
21	....	....	1,256.	628.00	1,884.00	....	1,000	+ 884.00	9,217.00	38.9	9,783.00	19,000
22	....	....	1,256.	628.00	1,884.00	....	1,260	+ 624.00	9,841.00	36.5	9,159.00	19,000
23	....	....	1,256.	628.00	1,884.00	....	1,580	+ 304.00	10,145.00	35.3	8,855.00	19,000
24	....	....	1,256.	628.00	1,884.00	....	1,880	+ 4.00	10,149.00	35.2	8,851.00	19,000
25	....	....	1,256.	628.00	1,884.00	....	2,200	— 316.00	9,833.00	36.4	9,149.50	19,000
26	....	....	1,256.	628.00	1,884.00	....	2,600	— 716.00	9,017.00	39.4	9,883.50	19,000
27	....	....	1,256.	628.00	1,884.00	....	3,000	— 1,116.00	7,901.00	43.8	10,999.00	19,000
28	....	....	1,256.	628.00	1,884.00	....	3,400	— 1,516.00	6,385.00	49.8	12,515.00	19,000
29	....	....	1,256.	628.00	1,884.00	....	3,900	— 2,016.00	4,369.00	58.0	14,531.00	19,000
30	....	....	1,256.	628.00	1,884.00	....	4,300	— 2,416.00	1,953.00	67.8	17,047.00	19,000

all utilities to settle down after a time to a more or less uniform condition as regards the percentage amount of accrued depreciation, and the annual requirements for renewals and replacements. After the various parts of a large public utility plant have gone through complete cycles of renewals, the plant settles down to a condition in which, saving extraordinary functional depreciation, expenditures for maintenance, repairs and renewals become practically constant. There is little fluctuation from year to year and the average by five or ten year periods are practically identical. This settling down or equalizing process, is very greatly hastened by the fact that all large systems are constructed piecemeal."

The above theory, which the writer has tried to refute, is also supported by James E. Allison, chief engineer of the St. Louis Public Service Commission, who in the report on the United Railways Company of St. Louis, presents the curve which is here reproduced as Curve VII. He says, (*Appendix A*, page 89):

"It has been the purpose of the writer to show by diagrams that piecemeal built properties of any complexity, will eventually assume a theoretical value curve, closely conforming to the straight normal value line, halfway between 100 per cent and the composite scrap value of the property."

It cannot be denied that the curve which he gives most certainly is a uniform curve and tends to support his theory. It should be noted though, that even his curve varies over a range of 15 per cent during the comparatively short time of 13 years, and although 15 per cent is small, it takes a different aspect when considered as 15 per cent of $30,000,000, the approximate value of the property, or $4,500,000.



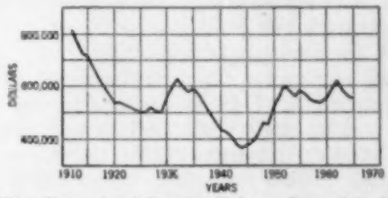
Curve VII.—Total Composite Theoretical Value Curve of the Depreciable Property of the United Railways Company of St. Louis as Given in the Report on That Property by the St. Louis Public Service Commission—1912.

As previously stated, the curve shown by Mr. Allison, is a remarkably smooth one, but when compared to Curves VI and VIII, it shows the danger of drawing a general conclusion from any one curve. Every complex property undoubtedly displays the tendency which Mr. Allison points out, but it would be decidedly unsafe to apply it indiscriminately to any property. The point is that each property should be investigated separately to determine its characteristics in this respect.

The second point, to show that under practically no condition will it be necessary to bring a property back to 100 per cent condition, has already been presented by many other writers, but it is given here again in conjunction with the conclusion from point number one. It is obvious that any property which has been built up gradually and not all at once, will have its various parts wear out in a similar sequence to that in which they were installed. Since different portions of the property will have to be replaced each year, it will never be necessary to replace all of them at once and so bring the property back to one hundred per cent condition.

As far as the point just made goes, most writers are agreed, but having reached that conclusion they claim that the property remains at a certain fixed condition, the exact per cent depending on the maintenance.

It is perfectly true that the entire property will not have to be renewed at any one time but only in the condition where there has been a uniform growth over a



Curve VIII.—Depreciated Service Values of an Actual Property. End of growth assumed Dec. 31, 1913—original service value $1,056,017—maximum per cent condition 7.70 per cent—minimum per cent condition 35.0 per cent.

term of years corresponding to the life of the property (see Table I and Curve I) will the property reach a fixed condition and remain there after the property has stopped growing. Also, as long as a property is growing whether uniformly or otherwise, there will be a variation in its per cent condition. In other words, there is an obligation to renew varying amounts of property in different years in the future, and any calculation of reserves based on an assumption that because of perpetual life the company will reach a stable condition either during or after its growth is entirely incorrect.

It will be noticed from an examination of the tables that while the property is growing, the per cent condition is decreasing, the rate of decrease varying inversely with the rate of growth. When the property stops growing it has reached a certain per cent condition and thereafter it varies between that condition and some other, dependent upon the manner of growth. When the growth stops the property may be at a minimum per cent condition, as in Table IV and Curve IV, where there has been a decreasing rate of growth; or at a maximum as in Table V and Curve V where there has been an increasing rate of growth. Table IV and Curve IV show that the property will vary between 30 and 53 per cent, while Table V and Curve V show, in that case, a variation of from 35 to 68 per cent.

From the above figures it is evident that each property, should it stop growing, will go through a cycle in which it reaches a certain maximum condition less than 100 per cent, this maximum condition being entirely dependent on the manner of the property's growth.

It may be argued that the writer has made arbitrary and special assumptions in taking cases where the period of growth corresponds to the life of the property, but both Tables II and V are based on other assumptions. Besides this, it is worth bearing in mind that any property may be divided into a series of groups in which the investment term corresponds to the life term, and that each of these groups will follow a condition curve of its own. For a complex property, therefor, there would be a series of such curves which would give a resultant one. This resultant curve, however, would also vary over a considerable range. This is borne out by Curves VI and VIII of actual properties.

Since it will never be necessary to renew the entire property, some of the reserve necessary to return it to the 100 per cent condition may be dispensed with. It is not correct, however, to say that since the reserve will never be needed it should not be obtained. The stockholder has a right to expect that his capital be kept intact at 100 per cent. How then is the reserve to be handled? This is taken up as the third point.

There are three conditions which may be used as di-

visions for the consideration of the laying aside and use of depreciation reserve. These are:

1. Company growing at the great enough rate to permit the investment of all the reserve in extensions.
2. A company not growing at a great enough rate to permit the investment of all the reserve in extensions.
3. A company which is not growing.

Take the first case, where a company is growing at a great enough rate to permit the investment of all the reserve in extensions. It is clear that the annual charge for depreciation will, in some years be less, and in some years more, than the cost of renewals. In those years that the cost of renewals is less than the charge for depreciation, the difference may be invested in extensions, and in those years in which the cost of renewals is greater than the depreciation charge, it will be necessary to issue securities with the extensions made from reserve as a basis, using the money from the securities for the renewals. The securities, however, should not be issued to an amount greater than the depreciated value of the extensions. Wherever the depreciation reserve is invested in extensions, it is necessary to keep a careful record of property of this class. It is essential that separate accounts be kept for capital investment and reserve investment. The trouble in the past was that no attempt was made to keep them separate.

In the second case, where the company is not growing at a great enough rate to permit the investment in extensions of the difference between depreciation charge for the year and renewals for the year, and in the third case where the company has stopped growing, it will be necessary to keep the surplus of annual allowance over cost of renewal for certain years, in a liquid reserve fund, so as to be able to make up the deficiencies in other years. That some money must be so kept is now clear, for point one shows the wide fluctuations in per cent condition and in yearly renewals. How much must be so kept will be discussed under point four.

At present it is interesting to consider in what years the peak demands, requiring a security issue for the first case and a withdrawal of money from the liquid reserve in the second and third cases, will fall. In any complex property there are groups of things having different costs and different lives installed in the same and different years. If the cost is considered as amplitude, the lives as frequency, and the years as phase displacement it may readily be seen that as different waves come into step and pass out again, peaks and valleys will occur. In order to determine the variation in renewal charges it will be necessary to make tables and plot curves of the future renewals in each group. These curves will take the same general form as those in Curve VI, but will be for total replacement costs, instead of remaining service value as shown there. If tables are once compiled it is a simple matter to change them yearly as further extensions are made in the various groups. By following such a plan it will be easy to see whether or not adequate provision is being made for the handling of future extensions and to predict in what years it will be necessary to issue securities.

As described in the introduction, the second portion of point three is to show that by reinvesting depreciation reserve in extensions, the stockholders' capital is kept intact, yet the depreciated value of the property is the fair one for rate making purposes both from the point of view of the consumer and the stockholder.

Table V is for a property in which the depreciation reserve is invested in extensions. Let us consider the tenth year. Here the total expenditure on the property both from capital and reserve is $25,120, which has depreciated to $17,047. This latter sum plus $1,953, which has been accumulated in the depreciation reserve during the past year and which as yet could not be reinvested, gives $19,000 the capital expenditure. Therefor, with the exception of the amount ($1,953) accumulated in the reserve fund during the current year and not yet invested, the depreciated value of the property is equal to the capital investment. Omitting for the time being the question of allowing a return on the $1,953 not reinvested, it is seen that allowing a return on the depreciated value of the property is practically equivalent to allowing a return on the original investment. The question of allowing a return on the amount held as liquid depreciation fund ($1,953) in the above case will be considered under point five. This procedure described above, is therefor fair to the consumer, for he is paying a return on the value of the property in use, and it is fair to the stockholder for he is earning a return on his original capital.

The fourth point is to show that for a company which has stopped growing or for one which is growing at a rate not large enough to use all of the depreciation reserve for reinvestment in extensions, it will be necessary to have a continually varying amount in a liquid depreciation reserve fund and that this amount will fluctuate in a manner depending upon the company's growth.

Table V shows the condition for a property which has ceased to grow after ten years. At the end of the tenth year there are $1,953 in the reserve. The sum laid aside annually for depreciation after that is $1,884, yet owing to the fact that the company has grown faster at one time than at another, in some years there will be less than $1,884 used for renewals and in some years more. The effect of this is to accumulate a fund over a certain period of years which is used over another period of years. Thus, starting with $1,953 in the tenth year, the fund reaches a maximum of $10,149 in the twenty-fourth year; after which it decreases to $1,953 again in the thirtieth year. This is graphically shown in Curve V. It is evident that since the $1,953 will never be used as far as renewal purposes go, it may as well be returned to the stockholders. Since it is assumed that the company has stopped growing, the hypothesis precludes the possibility of using it for extensions and it should therefor be returned to the stockholders in the form of cash. It should be clearly understood by the stockholders that this is a return of capital and not a dividend payment.

Curve V is for the conditions assumed for this particular case. Any other manner of growth would give a different curve. In order to tell for any other property just what accumulation would take place and to determine how much, if anything, may be returned to the stockholders because it will never be used, it would be necessary to make a study similar to the one shown.

It is not very difficult to see that for a company which is growing, but at a rate too small to use all the reserve, that portion of the reserve which is not invested in extensions and betterments will bear the same relation to the renewals as the entire fund does in the case where the company is not growing at all. That is, there will be an accumulation curve for the liquid reserve which will be similar to the curve for a non-growing property.

In either case there will be a necessity for a liquid depreciation reserve for renewals and this reserve will vary from year to year. This fluctuation may be likened to the storage of energy in a flywheel. Just as there is no way to remove the energy from the flywheel except by stopping it, so there is no way of avoiding the fund as long as it is desired to make the renewals as they fall

due. While the energy is stored in the flywheel it is of no direct use; yet it would be impossible to run the engine without a flywheel. The energy must be so stored to make it instantly available. The depreciation fund must also be stored to make it instantly available.

The fifth point is to show, that since such a liquid depreciation reserve may be necessary for a growing company and will be necessary for a company which has ceased to grow, that the same return should be allowed on such a reserve as on any other capital invested in the property, and that such return should be available for dividends, provided that the cost new, less depreciation is to be used as a basis for rate making.

Before trying to prove this point, the following decisions are given to show the stand taken in some cases in regard to this matter. The Nebraska State Railway Commission says in Re Application of the Lincoln Telephone and Telegraph Company, for authority to increase rates (A. T. & T. Co., *Com. L.* 134 June 26, 1913, Nebraska State Railway Commission) "It will also be the policy of the commission to expect of the corporation that it shall, so far as possible, use the depreciation funds . . . . in making extensions and betterment of the plant. Such part of the plant as is represented by the investment from the depreciation reserve shall be permitted to earn the same ratio of return as the stockholders' investment, but neither such reserve fund nor the earnings therefrom shall be available as dividends to stockholders, or for any other purposes than those set out."

In this decision the commission allows a return but it seems to consider the reserve as a sinking fund, the returns on which must be put into the fund. Further, it differentiates between investment from reserve and stockholders' investment as though the depreciation reserve were not also stockholders' investment.

In the Louisville and Nashville R. R. Co. v. Railroad Commission of Alabama the special master says (U. S. Circuit Co., Middle Dist. of Alabama. Report of Wm. A. Gunther, special master in chancery, 1911) "The defendants further insist that interest should be allowed on the balance in the replacement account. It is a mistake to suppose that such a charge is proper."

Also in the case of the Louisiana R. R. Commission vs. Cumberland Telephone Co., (212 *U. S.* 425) the court says: "That it was right to raise more money to pay for depreciation than was actually dispersed for the particular year there can be no doubt, for a reserve is necessary in any business of this kind, and so it might accumulate, but to raise more than money enough for the purpose and place a balance to the credit of capital upon which to pay dividends cannot be proper treatment."

There are two chief arguments against allowing a return on the depreciation fund. The first applies only to that portion which is not invested in extensions. It is to the effect that since the fund is lying idle, bringing no return, or is at best invested in bonds bringing a low return, that this is all the return to which it is entitled. The second argument applies either to the case where there is a liquid reserve or the reserve is invested in extensions. It is to the effect that since the money for the reserve is furnished by the consumer, he should not further be required to pay a return on it.

Taking the second argument first. The whole discussion hinges to a large extent on the question as to whether or not the stockholder may expect that his capital be kept intact at 100 per cent. How many men would go into a business of any kind if they could not make enough to replace their capital goods as they wore out and besides earn a return on their investment? That all businesses do not do this does not alter the fact that they expect to do so when they start. The recognition of depreciation and the allowance therefor is in itself an acknowledgment of the correctness of keeping the capital intact.

The capital which is wasting away is certainly the capital of the stockholder. He uses up his capital in the service of the consumer and the consumer replaces the capital so used. The consumer is making a just restitution. He is replacing something which originally belonged not to him but to some one else. Why then should the replaced capital have a different status from the original? It should not. The capital in a depreciation reserve fund should be treated the same as any other capital. It should be allowed the same return and for the same purposes.

Some argue that since the depreciation fund is lying idle (*i.e.* that portion not invested in extensions) or at best is invested where it brings only a low return, it is not entitled to more than it can earn. But is it lying idle? It has been shown that for any other than a growing company which can invest the entire reserve in extensions, there will necessarily be a continually varying amount in the liquid reserve. Besides this, even a growing company will have to carry from year to year some of the fund which it cannot reinvest at once. Is the depreciation reserve not just as necessary a part of the business as the working capital, of which there must always be a more or less fluctuating excess earning a low return, but which no one denies is entitled to the same rate of return as the capital actually invested in useful physical property? Is the liquid reserve, which is the stockholders' capital, not a guarantee to the consumer that the property will be maintained in first class operating condition and so give him the best of service? It may be said that he has a right to expect good service, but most people when not considering a public utility are willing to pay extra for good service. Thus, under competitive conditions a company which kept no reserve could give service at a lower rate than one which did, but it would be neither as good nor as reliable as that furnished by a company which kept a reserve. Would the public not be willing to pay for the greater reliability and better service?

No one questions the fairness of the proposition that the company be made to pay interest on deposits of consumers, yet in viewing that question the only consideration is that the consumer is deprived of the use of his money and should receive a recompense for it. The corporation's use of his money is not thought of for a moment in deciding whether or not such a charge is fair. To be sure, the company may devote it to a profitable use, but assuming that the company was not on a paying basis would that in any way alter its obligation to pay interest on the deposit? The stockholder is in much the same position as the consumer described above. He is deprived of the use of some of the money; but why should there be any further consideration of the justness of allowing him a return, regardless of what the corporation does with his money within legitimate limits, than there is in the case of the consumer? If the argument is to be that the funds are lying idle would it not be just as fair on the part of the corporation to say "Because the consumers' deposit will never have to be paid back in a lump sum, we will use them in our depreciation reserve and since it is lying idle we will have to pay no interest on the deposits?" What a howl would go up!

To bring out the point still more clearly, refer again

to Table V. Suppose that an appraisal were made in the twenty-first year when the property was in a 39 per cent condition. It would be unfair to base rates on the $9,783 which is the corresponding value of the property, when it is known that as the renewals are made the per cent condition will go up as high as 68. Under this scheme the rates would depend entirely upon the condition of the property in the year it was appraised and there can be no question as to the unfairness of such a proceeding. The rates should be based on the depreciated value of the property in any year plus the amount in the depreciation reserve, provided only that the sum is not greater than the original capital expenditure.

In conclusion it may be said (1) No matter how large a property is, it will not necessarily come to any fixed per cent condition nor anywhere near it. (2) The per cent condition of any property, the amount in the reserve fund, and the rise of the reserve fund depend upon the past, present, and future growth of the company, and that these conditions and their relations should be studied for any property whether a public utility or a private corporation. (3) Rates should be based upon the depreciated value of the property plus the amount in the depreciation reserve as long as the sum is not greater than one hundred per cent of the total capital investment.

Samuel Hill Offers Free Service

One thousand Portland, Oregon, householders are in line for telephone service without any cost to them for a period of six months if they merely accept a little gift announced by Samuel Hill.

Mr. Hill proposes to have the Home Telephone Company install that many instruments in as many homes and will pay the bill out of his own pocket for half a year. The condition is that the Home telephone shall be the only instrument used by the person accepting the "gift."

Mr. Hill no longer is president of the company which he founded, but retains a large proportion of the stock. As a private citizen, but acting as an interested friend of the company, he is making this offer to start a revival of the automatic vogue.

"Mr. Hill's idea is that the automatic should be the official telephone of Portland," said J. C. Middleton, manager of the Home company. "He believes that the telephone habit depends upon the extent to which the telephone system can be used. So, to get people into the habit of using the Home telephone exclusively, he has made this offer.

"The offer is made in good faith, without any strings whatever. He believes that if 1,000 more people use the automatic exclusively for six months they will continue to use it and therefore prove of benefit to the permanent welfare of the company. He is willing to take that chance.

"To say the offer is altogether philanthropic would be absurd, but nevertheless Mr. Hill believes this is a proper time to make it."

Having no longer any official connection with the Home company, Mr. Hill is able to make the offer at his own personal expense without any infraction of the public utilities laws, company officials said.

Several hundred applications have been received and the telephones will be installed as rapidly as possible in homes that are on the company's lines.

"At present the Home telephone is installed in 8,500 homes, offices and stores in Portland," said Mr. Middleton. "Every part of the city, St. Johns excepted, is reached by our lines. At present we have 41,348 miles of wire strung in Portland alone. The business has grown to such an extent since the system was established here that we were compelled to build four first-class exchange buildings in Portland. In addition we have three smaller exchanges at Linnton, Oswego and Lents.

"The Home company also operates systems in Albany, Corvallis and Oregon City. It is an 'owned in Oregon' company and most of the bonds are owned by Portlanders and its earnings are spent at home."

Operating Courtesy

The operating rules of the Keystone Telephone Company of Philadelphia were recently amended so as to provide important changes in the phrases heretofore used by the operators in their contact with the public, announces the *Keystone Telephone Wire*. A good illustration of these changes is presented in the first response of the operator to a patron's call. Formerly she said simply "Number." Now she says "Number, please." In the case of a busy line she formerly said "The line is busy." Now she says, "I am sorry, the line is busy."

When the Keystone Company first began operations the general phraseology was in keeping with that now reinstalled, as in the case of "number, please." At the time that was the general practice with most companies. But there came a day when many wise managers reached the conclusion that, for efficiency's sake, brevity was the prime requisite. They thought that telephone operating could be conducted more expeditiously, and hence with more satisfaction to the public, if all unnecessary words were cut out of its forms of speech. This was the view adopted by the Keystone management. So we had the short, abrupt, but businesslike expressions, without any decorations. A lot of people were pleased with that system. They thought it was a timesaver and finely up-to-date. But a lot of others did not like it at all. The brusqueness of it gave them a jar every time they heard the responses, and they felt that we had sacrificed something of desirable nicety, without a corresponding gain in efficiency and promptness of service. This latter view eventually became the belief of all those entrusted with the management of the Keystone Company's affairs. So we have the polite adornments of speech back again, and we are sure we like them much better than the old unvarnished expressions.

It is first, but not only, the public that is to be considered in a matter of policy like this. We have also to consider ourselves. We need politeness in our daily lives. We need to have it coming in our direction, and we need to give it. It makes us better in mind and heart. It makes life sweeter. And from a very practical point of view, it certainly makes things go more easily and saves us work and bother and time. In other words, it oils the machinery of life. Hence saying "number, please," and the like, is sure to make us feel more kindly personally, as well as the fellow to whom it is said, and so make our daily tasks, as well as his, a bit easier in the doing.

"She discovered the telephone was out of order and immediately called up the police," reads a story in the *Southwestern Telephone News*. As our own p. b. x. operator says, some telephone!

European Telephone Development

Translations from the Foreign Press and Communications from European Engineers

BY FRED W. SCHOLZ

THE development of telephone systems has brought with it a more and more marked tendency to abandon overhead telephone lines wherever possible, and to substitute for them underground telephone cables. In many cases this practice is forced upon the telephone department owing to the difficulty of placing a large number of overhead wires. This is especially true in cities and towns having a rapid growth with a heavy telephone service. The extension of telephone wires becomes more and more difficult even in the districts between cities, owing to the restriction occasioned by the rapid extension of interurban railway systems. The interference by electric railways with telephone and telegraph communications has been the subject of much study and discussion and is another factor urging underground cable work.

It is therefore interesting to see what a French telephone engineer, M. Georges Viard, has to say in relation to telephone cables and the results which are derived from them from a commercial viewpoint. His article is all the more interesting, as he gives a comparison between European and American practice.

Ordinary telephone cables do not permit telephoning over long distances. Theory shows us that the increase of the self-induction of a line increases its transmission effects over greater distances. In practice two methods can be employed in order to obtain an artificial increase of the self-induction. The first, known under the name of "Krarupization," after the Danish engineer Krarup who first practiced it, consists in increasing the permeability of the space surrounding the conductors by twisting spirals of soft oxidized iron wire of about 2/10 to 3/10 of a mm. around the copper wires which make up the circuit.

The second proceeding, which is known under the name of "Pupinization," from Dr. Pupin, its inventor, indicates that the additional required self-induction can be produced without any trouble by the use of self-induction loading coils placed at certain points in the circuit.

Pupin expressed the degree of balancing effect between a non-homogenous conductor thus constituted and the corresponding homogenous conductor, which should have the same resistance and the same self-induction in total, but uniformly distributed, as follows: A non-homogenous conductor is sensibly equal to the corresponding homogenous conductor as $\frac{\varphi}{2}$ is to $sin\ \frac{\varphi}{2}$. The angle φ is the angular distance between the two coils; the angular distance 2π corresponds to the length of a wave. When designating by l the distance between two consecutive coils and by λ the length of a wave, we have:

$$\frac{\varphi}{2\pi} = \frac{l}{\lambda}$$

Pupinization permits us to obtain a self-induction greater than that obtained with the Krarup cables, and in addition the cost is much lower when considering the greater transmission distances obtained. It is this system then, that ought to be employed exclusively in the development of any telephone system. Krarupization comes into play only under special conditions. We will, therefore, limit this study to the installation of pupinized cables and the results which they give. The question has been expounded from the theoretical viewpoint in so many aspects that it is hardly worth while going over the ground again. We will therefore devote ourselves entirely to the practical aspect.

The first applications of pupinized cables go back about fifteen years. Since then enormous progress has been made in this field of construction; the period of fumbling has passed and the big companies and national administrations have already standardized pupinization. In telephone matters it is common to standardize the equipment, i. e., to codify the general rules of construction and of operation of all types and characters and to stop further work on types of equipment that merely fit the needs of the period. This method of action is naturally economical; moreover, it brings with it no inconvenient factors, for equipment needs to be duplicated and multiplied over and over again, and it is quite natural and logical to design and construct the equipment which has been found best for all purposes and to train the operating and manufacturing forces to install and repair such standard equipment and in that way get an efficient, familiar body of mechanics and operating engineers.

This system, moreover, does not mean the abandoning of improvements of existing types. As a matter of fact, standards are always changed as soon as a part of the equipment has been so much improved as to make the older type obsolete and to call for the substitution of the better new equipment. When that time has come the standards are simply changed to meet the new needs. The normal evolution of an innovation in telephone matters is somewhat as follows: The idea is first studied from the theoretical point of view; tests are made in the laboratory, and when they are sufficiently advanced are transferred over to practice, which usually leads to further improvements. These improvements are then applied to the latest design of material, which means a further perfecting. There comes a time when the equipment has been perfected so far that it suits all needs for the present and the immediate future, and this is the time when "standardizing" sets in, i. e., when one stops the advance of a definite type of apparatus and frames rules to apply to its manufacture and installation.

The study of pupinization of underground cables embraces three factors: (1) The determination of the amount of self-induction to be added per kilometer (0.6 mile); (2) the distribution of coils equaling this self-induction; and (3) the specifications of these coils. When we increase the self-induction of a circuit, its weakening effect decreases at first, to increase, however, starting at a certain point; there is a possible minimum of weakening of capacity and a favorable maximum of self-induction, to exceed which would be not only useless but even harmful; we call this point the maximum self-induction. For circuits of any given capacity, the maximum self-induction is proportional to the resistance in kilometers. It varies a great deal with the diameter of the conductors. In practice the amount of self-induction added is always considerably smaller than the maximum self-induction, the reason for which practice will be discussed later.

As regards the distribution of the induction coils, Pupin's rule in the form in which it was first expressed does not seem so self-evident at first. There is needed for current work some rule which will permit fixing the distance between coils without any hesitation. If one had to consider the transmission of currents of one single frequency, one might determine the distance between coils by determining the difference which one allowed between the pupinized lines considered and the corresponding telephone lines. Thus, for example, for a tolerance of 5 per cent, one would then have:

$$\frac{\frac{\varphi}{2}}{\sin\frac{\varphi}{2}} = 1{,}05, \text{ whence: } \frac{\varphi}{2} = 0{,}53, \text{ and } l = \frac{L}{6}$$

which means, in other words, that one would have six coils on the average for one wave length.

But the question is not as simple as all that, for telephone currents are not sine-shaped currents of a definite frequency, but are composed of sine-shaped currents of varying frequencies. The distribution which corresponds to a certain degree of equivalence for one of these frequencies (the most essential one perhaps,) would then give a different degree of equivalence for the other frequencies, since the wave lengths depend on the frequencies Certain currents are enfeebled in a greater degree than others, and for their sum, which represents the telephone current for conversation, there is a certain distortion, and this alone would require additional points to be determined in spacing the induction coils. This distortion is greater in proportion as the space between the coils is greater. If the distortion is not very great, the ear can analyze the articulated sound, to which the current corresponds; but if the distortion passes a certain limit, it cannot be recognized any more. J. A. Fleming compares this fact very aptly to a caricature. A caricature is a design in which the different elements and details are not exactly drawn, but are deformed and distorted; certain are enlarged and certain are diminished in varying proportions. If the process is not carried too far, one can still guess what it represents, but beyond a certain limit the caricature becomes illegible.

The difference between the pupinized line and the corresponding homogenous line is not the only cause for distortion; the variation in losses, which is always the inverse of the insulation and is given in ohmic values, and also the variation of the effective resistance of the coils with the frequency are some of the causes of additional losses.

For paper or gutta percha insulated cables, the losses are proportional to the frequency. The effective resistance of the coils also varies directly with the frequency by reason of the losses due to hysteresis in the iron and the Foucault currents. The result is that good transmission of speech is not obtained uniformly well when using Pupin's rule in a more or less strict manner, but that for a given material, one can only find by actual speaking experiments what space between coils is the best for the line. The results thus obtained take account in general of all the distortions on the line.

The wave length on a line with a high self-induction is given by the formula: $\gamma = \frac{2\pi}{\omega\sqrt{CL}}$, C and L being respectively the capacity and the self-induction per kilometer, and ω the pulsation of the currents considered. Pupin's rule stating that there is a certain minimum number of coils for a wave length might be expressed by the formula: $CL_1l<A$; A being the number which must be determined by experience, as was just stated, l the distance between two coils, C the kilometric capacity of the circuit, and L_1 the total self-induction of a coil. One brings in the magnitude L_1, because one may consider that the self-induction is entirely restricted to the coils.

In England, the following rule is given for the formula: $CL_1l<25$; C, the capacity per mile, being expressed in microfarads; l, the distance between two coils, expressed in miles; and L_1, the total self-induction of a coil, expressed in millihenrys. Nothing is changed if the unit of length employed is the kilometer instead of the mile.

In America the rule used in telephone work has received another form: The front end of the electric wave which proceeds on the telephone line must encounter at least 7,000 coils per second.

In Germany one has added another quantity, which is the pulsation of the free oscillations of any element of the pupinized line. Each coil forms, with one-half of the sections of the neighboring lines between any two coils, an oscillating circuit, whose inductance is L_1 and whose capacity is $\frac{Cl}{4}$, always taking account of the fact that the capacities of two sections are placed in series. The pulsation of the oscillations of such a unit is expressed by the equation: $\omega_0\sqrt{L_1\frac{Cl}{4}} = 1$. The pulsation ω_0 must be as different as possible from the pulsation of the currents to be transmitted. It has been found that ω_0 should have a value at least equal to 16,000. The table here reproduced shows clearly the great differences which exist between the rules followed in the different countries.

TABLE I. PUPINIZATION RULES OF DIFFERENT COUNTRIES.

	Maximum Values of the Product CL_1l	*Minimum No. of Coils Met by the Wave Front in One Second.*	*Pulsations of the Free Oscillations of an Element of the Line.*	*Relative No. of Coils Used in the Different Countries.*
England ...	25	6.325	12.650	79
America ...	20.4	7.000	14.000	87.5
Germany ..	15.6	8.000	16.000	100

In France, during the first few tests with pupinized lines, was also considered the value of the pulsation ω_0, which was assumed to be above 16,000. Since that time, engineers have asked whether it would not be more economical and convenient to approach the formula used in England. Judging from the results obtained by the British, the rule of $CL_1l<25$ seemed sufficient and was eventually adopted by the telephone department. C is the kilometric capacity of the circuit expressed in microfarads, L_1 is the total inductance of a coil in millihenrys; l is the distance between two coils in kilometers.

The divergencies in the distribution of coils among the different countries cannot well be explained only by the difference in material employed and by the difference in language; one can only attribute it to the viewpoint more or less clearly perceived by the various officials in charge of this work. It is clear that the first requisite in any telephone work is the maximum efficiency obtainable, i. e., sufficient clearness both of speech transmission and of listening on the other end of the wire. It does not mean, however, that the various elements of sounds and vocal elements used in conversation should be perfected to the highest degree, so as to approach the most artistic rendering of the voice. This is especially true if the obtaining of such perfection should result in higher expenditures than seems necessary. Experience has shown that

the series of coils having the inductances indicated in the second table have been found to give the best results. It is only for reasons of vital importance that changes from the standards here expressed are used in foreign telephone lines.

TABLE II. TYPES OF PUPINIZED CABLES USED ABROAD.

Type of Pupinization.	*Inductances of Coils in Henrys.*	*Distances Between Coils in Km.*	*Additional Kilometric Inductances.*	*Values of the Product CL_1l.*	*Characteristics.*
Very Weak	0.060	9	0.007	21.6	410
Weak	0.135	4	0.034	21.6	920
Average	0.175	3	0.058	21.0	1200
Strong	0.250	2.150	0.116	21.5	1700

This table refers to the pupinization of a cable, having a kilometric capacity of 0.040 MF.

The numbers given in the "Characteristics" column follow the values: $\sqrt{\frac{L}{C}}$

Before passing to the discussion of the values expressed in this table, it may be worth while saying a few words about the specifications of the coils; if we can so express it, the choice of quality of the inductance added. In the first place, we know that we cannot produce inductance without resistance; consequently, the increase of the self-induction of a circuit brings with it an increase in effective resistance. As a rule we judge coils, from this point of view, by the magnitude of $\frac{R_1}{L_1}$ of their resistance R_1 to their inductance L_1, these quantities being measured at a frequency of 800. This quantity, $\frac{R_1}{L_1}$, represents the supplementary resistance added for each henry of self-induction. The decrease of this factor leads to a rapid increase in weight of iron and copper employed in the construction of coils, and consequently increases the cost of the latter considerably. It is best, therefore, to limit this factor in order not to pay too highly for a comparatively slight increase in telephone distance. Up to the diameter of 3 mm. one takes $\frac{R_1}{L_1} = 50$; above that, $\frac{R_1}{L_1} = 35$. For very large diameters one can even pass to 25 and 20. There are other details which have to be watched in regard to the construction of coils, such as: (1) High insulating factor; (2) a low mutual inductance between coils placed near each other; (3) reduced volume; (4) a weak residual magnetism. All these points deserve special attention on the part of the constructor and must be carefully watched when estimating the expense of pupinization.

Let us now return to the table. Each type of coil corresponds to a certain distance and consequently to a well defined added kilometric inductance. The characteristic is near the value $\sqrt{\frac{L}{C}}$. It is this quantity which characterizes the type of pupinization; for a certain power given, it determines the voltage at which transmission is effected. Before adopting a certain type of pupinization, it is worth investigating what the results will be. First of all, the stronger the pupinization, the higher the voltage at which the energy is transmitted. In the ordinary telephone cable it is not difficult to obtain a sufficient absence of inductance between the different circuits, but this is not the case in pupinized cables. In these cables we always have in the same double pair of conductors a very strong inductance and careful steps must be taken to balance the capacities of circuits. To this action is added the inductance of the coils, which also cannot be neglected. The losses through poor insulation are more marked on account of the increase of voltage; consequently, if there is no equal distribution of losses for each wire, there will result a lack of balance, which will reduce the effect of the inductance. Last of all, it is necessary to remark that since the power of the circuits is increased, all disturbances of the e. m. f. will produce a much greater effect than is the case in the ordinary cable. In practice it may be wise not to pupinize too strongly, if one wishes to reach a perfect combination of effect, free from influence on the part of other circuits. There are other reasons that speak for low or weak pupinization. As a matter of fact, in the latter case distortion is reduced to a minimum; the characteristic depends on the magnitude of that of the aerial lines, whence the reason for absence of reflection at the junction of cable and aerial lines. Again, in order to obtain a certain reduction, determined in advance through theoretical and practical experiments, one can use either conductors of small diameter strongly pupinized or conductors of large diameter feebly pupinized. In other words, one can use either less copper and more coils or less coils and more copper. It is clear that with an equal cost it is better to use a feeble pupinization on lines that are used a great deal and do not cover too great a distance. As a matter of fact, in England and France the practice is to use a low pupinization for medium distances, as this has been found to give the best results. In America and in Germany they pupinize the lines strongly. These differences are due to the differences existing between the various countries and not to differences in technical opinion. There is no method of pupinization that can be applied to every problem, set in an absolute fashion. Different solutions may be equally good for different purposes, conditions themselves being different. It would be a great mistake to adopt the results obtained with one telephone line on another line, whose conditions may be entirely different from the first one.

In summing up, we can say that weak pupinization, although fairly high in price at first installation, does not bring with it quite as many drawbacks as strong pupinization. It brings a better result in the various combinations of cables employed; where it is used with medium or low diameter conductors, it gives telephone circuits whose reduction in capacity is only slightly below that of overhead wires of the same diameter and a comparative characteristic. The utilization of the copper conductor is then superior to that in open wires. To obtain the proper technical treatment of pupinized cables needs, of course, trained workers who are familiar with the ground. The repair men and engineers in charge of this work should be specially trained and the cables might well be given a special color effect. To entrust the work of these cables to untrained men would jeopardize the success of the combination of cable and loaded coils and would not give the best results. The question is whether the advantages derived from a cable are worth the extra expense incurred in them. While the first installation cost of cable material is higher, the repair and maintenance cost is lower than that of overhead wires, chiefly because there are not the causes of accidents and damage from storms and the weather conditions that we have influencing open wires. Moreover, communication over cables is superior to that over open wires and that results in greater confidence by the public and consequent greater use of the telephone, which, after all, is what the telephone service aims at, above all other things.—*Annales des Telegraphes et Telephones.*

INFORMATION DESKS AT THE PARIS EXCHANGE.

The Paris telephone exchanges have improved part of their equipment, eliminating the plugs or general jacks and putting in service better information desks to increase the efficiency of the service and reduce the labor of the operators. Formerly, whenever it was necessary to inform an operator that a certain line was not to be used any more, for some reason or other, one plugged all the general jacks corresponding to that line and the color of the plugs indicated the reason for cutting off the subscriber's service. This was to enable the operator at the information desk to inform some subscriber asking for that certain number, why he could not be connected with the cut-off line. Thus, white plugs were used for subscribers who canceled their contract; brown plugs were used for those whose service had been suspended temporarily for failure to pay the contract price; blue plugs for those who used their telephones only during a certain part of the year; red ones for transferred subscribers, who had moved and been changed from one exchange to another one. Black plugs were finally used for those subscribers who had reserved personal lines, having several lines at their disposal and reserving one private wire for their own calls, not wishing to be called at all on this wire from the exchange. It is easily understood that keeping these plugs up to date, and the service connected with them, was quite an arduous duty for the operators at the information desks.

New special switchboard tables that have been installed allow all of those subscribers who have been deprived of the use of their lines for some reason or other, being grouped together on these boards. The collection of these subscribers on the information switchboards permits the elimination of all of the plugs, except the black ones, whose use was a permanent cause of trouble. It facilitates the work of the operators at the multiple switchboards in that the latter need not give the numerous answers relative to the cutting off of various subscribers, but leaves this work to the operators at the information desk. The line of the subscriber in question is connected at the intermediate distributing board on the side of the general jacks by soldering at the joints and connecting to a jack at the information desk, to which jack is connected a call lamp. As the diagram shows, the lighting of the call lamp is operated by an alternating current relay, which attracts its armature when the multitple switchboard operator sends alternating call current by the aid of her automatic calling key.

The information desk operator has the use of a single cord for each subscriber. As soon as a call lamp lights, she places the plug of her single cord in the corresponding jack, which action immediately cuts off the circuit to the call lamp. The operator now can answer the subscriber and answer all questions concerning the cut-off service or indicate the new number of the removed subscriber, etc. For this latter end, information has a daily register, kept up to date, which has all the changes of subscribers' numbers and also indicates his financial standing from the standpoint of the company. A change requires soldering to the joints of the rows of jacks of the intermediate distributor, but in case the subscriber is dropped only temporarily, it would necessitate a large number of solderings. This would eventually weaken the entire equipment, for the soldered plugs would have to be removed when the subscriber resumed service, and the large number of solders and removals of soldered joints would mean a great deal of labor on the part of the mechanics of the exchange. It has been remarked that it is usually about the same subscriber or number of subscribers who default in their payment and the soldering has been avoided by very simple means. These subscribers' lines have been made to end at the intermediate distributing frame in a row of jacks, and the connection with the subscriber's line is brought about by the use of cords of convenient length, terminating on one side in a plug, and on the other side in a sort of cover or shell, fitting into the connection of the line to be plugged. It may be desirable to use the jack of a subscriber who has been definitely abandoned for use of a new one. To do this it is necessary to connect a third wire at the same time with the other two conductors of the line and to connect it at the information desk to a resistance of 30 ohms which is grounded. It is clear that the connection of a third wire is useless with subscribers who are only temporarily disconnected, since the local jack of such subscribers must be preserved for later use. An information table for this purpose with a capacity of 800 lines has been in use in one exchange for quite some time and will be copied in all of the urban exchanges after a certain time of testing. —*Annales des Telegraphes et Telephones.*

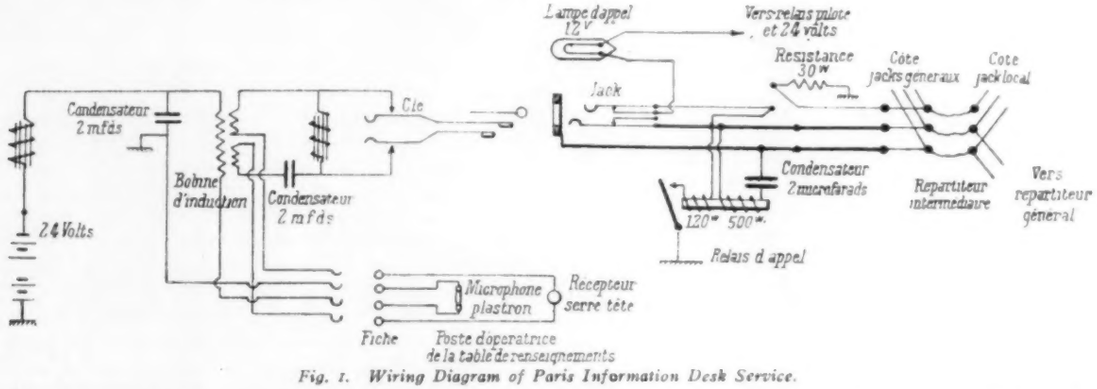


Fig. 1. Wiring Diagram of Paris Information Desk Service.

Readings in the figure: Condensateur=condenser; bobine d'induction=induction coil; microphone plastron=chest microphone; recepteur serre tête=head receiver; poste d'operatrice de la table de renseignement=operator's place at information table; fiche=plug; relais d'appel=calling repal; lampe d'appel=calling lamp; vers relais pilote=towards pilot lamp relay; côte jacks generaux=to general jacks; cote jack local=to local jacks; repartiteur intermediaire=intermediate distributing frame; vers repartiteur general=to general distributing frame.

The Leeds and Northrup Company devotes Bulletin No. 434 to a description of the "Students' Kelvin Bridge," a simplified instrument for making low resistance measurements and teaching the principles of such measurements.

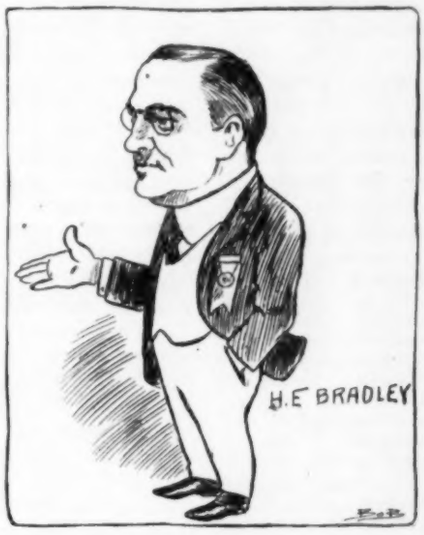
The Eastern Traffic Association

History, Accomplishments and Purposes of an Interesting Organization

BY H. E. BRADLEY

TURNING back to the days when Independent telephone service was looked upon as a joke, and hostile interests were constantly belittling and hampering the efforts of the men who were the pioneers in the Independent field, we find in and around the city of Philadelphia seven Independent companies struggling against the obstacles constantly laid in their path by the opposition.

That it was a struggle in those early days none can deny, but with such a determined spirit had these early pioneers labored that by the fall of 1900 these seven companies had managed to connect their toll lines in such a manner that it was possible for each to give a fair quality of toll service to the others. No thought or consideration, however was given to the question of how this class of service was to be handled or accounted for, no particular care was taken to keep accurate records and no settlements between companies were attempted.



Not a Very Good Likeness of the Association's Secretary-Treasurer, but Probably the Best the Cartoonist Could Do

By the middle of 1902 this interchangeable business had increased in volume until it became imperative that some plan should be devised for its care; some plan that would systematize methods of reporting, checking and pro-rating, and provide for standard rates and routing instructions between all points.

During September and October, 1902, several meetings were held in Philadelphia, attended by the officers of the seven companies previously mentioned, with the result that at a meeting held on November 17, 1902, in the offices of the United Telephone & Telegraph Company, at that time located at 112 North Broad street, Philadelphia, the Eastern Traffic Association was organized. The officers elected at that meeting were: C. E. Wilson, of the Keystone Telephone Company, president; W. D. Barnard, of the United Telephone & Telegraph Company, vice-president, and William W. Olheiser, of the Eastern Telephone & Telegraph Company, secretary-treasurer. Mr. Wilson retained the office of president from that time to the time of his death in 1913, and much of the early success of the association was due to his interest and influence. Mr. Barnard also retained the office of vice-president until his death, late in 1905, and worked diligently in the interest of the association.

Offices were immediately opened in the Keystone building, in Philadelphia, and the present secretary-treasurer was employed as superintendent, to take charge of the work and install the system which had been outlined by him at the meetings previously held.

The first six months were employed in compiling the data to carry on the work. It was necessary that the association have a complete list of all the points operated by each company and an accurate circuit map of each company's lines. Strange as it may seem, it was found that this information was not possessed by some of the companies themselves. One company had no chart record of its circuits, and in order to get this information it was necessary to call up each individual office and test out each circuit. Another had no complete record of its toll points, while another made no ticket record of calls. Of the other four companies each was doing its best, in its own way, to care for the business they were able to handle. Rates were usually whatever each company chose to charge, no attention was paid to overtime charges and an operator was generally compelled to try out a circuit before she could tell if it were possible to give service to the point desired.

This was the condition of affairs when the Eastern Traffic Association began its campaign for the standardization of interchangeable toll service. The very first step taken was the adoption of a standard toll ticket for in, out and through business, and a standard form for the reporting of the same to the association. Millions of these forms have been used, and with slight changes they are still in use today.

The first settlement attempted was for May, 1903. There being no reliable records of business prior to that date, an accurate settlement was absolutely impossible, and it was decided that each company should keep whatever money it had collected on business sent to the others. In looking back over those first reports, it is hard to realize that such conditions could ever have existed. When we say the first settlement "attempted," we use the word advisedly, for that first attempt was almost a failure. The reports were so far from correct that it was necessary to get a second report from three of the seven companies before a settlement could finally be made.

Following the standardization of reporting methods, a Tariff and Route Book was issued, giving a list of all the points operated by the companies, the rates between all exchanges and the best routes, so far as they could be determined with the meager information at hand. These books, though far from correct in many details, were a great help to the companies and the means of greatly increasing the toll business. Keeping pace with the increase in membership and territory covered, four separate issues of Tariff and Route Books have been made, with supplements from time to time, and a fifth issue is now in course of compilation.

From this small beginning of seven companies the association has enjoyed a gradual growth to its present proportions. Its membership now numbers eighty-eight companies operating in eight different states. During the fourteen years since its organization there have been admitted to membership one hundred and seventeen companies. The difference of twenty-nine between that number and the present membership is accounted for as

follows: Twenty have been consolidated with other companies still members, eight have sold out to the opposition, and one was forced to lose its membership when a connecting company sold out. The membership is distributed as follows: Pennsylvania, 67; New Jersey, 9; Ohio, 5; New York, 4; Delaware, 1; West Virginia, 1; and Maryland, 1. The eighth state is Virginia, a portion of which is operated by one of our Pennsylvania companies. While West Virginia shows but one, that company represents a consolidation of territory formerly operated by six separate companies, and the five Ohio members are sufficient to give us access to points in all parts of that state, as well as through to Indiana and Michigan points. It will also be noticed that the association enjoys the distinction of never having lost a member through resignation. Three new companies were admitted in 1916.

In the following statement is shown the amount of business handled and number of messages reported, yearly, since the Association began making settlements:

Year	*Total Business*	*No. of Messages*
1903 (7 months)	$ 37,023.34	147,095
1904	61,158.24	235,224
1905	130,145.17	456,132
1906	177,993.85	689,667
1907	191,274.50	742,750
1908	204,857.04	816,331
1909	235,256.50	891,692
1910	259,874.35	929,563
1911	261,207.35	967,435
1912	308,576.05	1,007,349
1913	342,201.04	1,137,337
1914	342,284.18	1,251,308
1915	366,560.41	1,593,148
1916	411,704.62	1,784,678
Total	$3,330,116.64	12,649,709

It will be noticed by these figures that every year has shown a substantial increase over the preceding year. The increase of 1916 over 1915 being $45,144.21 in tolls and 191,530 messages. Bear in mind that the association handles only interchangeable toll business, and has nothing whatever to do with the toll business handled over any one company's line. Several of our larger companies handle more toll messages over their own lines than the total amount reported to the association.

In 1906 an interchangeable coupon plan was adopted by which each company was enabled to sell to its subscribers, at a reduced rate, coupons which would be accepted by any member of the association in payment for interchangeable toll service. Since this plan went into effect coupons valued at $544,107.50 have been issued to the various companies, which should prove beyond a doubt that, as a business proposition, the coupon is worthy of some consideration. In 1916 coupons valued at $80,270.00 were issued, which is an increase over 1915 of $30,055.00.

In April, 1915, at a special meeting of the association held in Harrisburg, Pa., it was decided that all final settlements should be made through the association, beginning with the business for May, 1915. Prior to that time it had been the custom of the association to mail a settlement sheet to each member each month, showing the individual balances and leaving the final settlement to be handled direct between companies. This change has been of the greatest advantage to all companies and has simplified to a minimum the troubles of settling for this class of service. Since this plan was adopted the association has handled in settlement with its members $103,012.49, $37,426.59 for the last seven months of 1915 and $65,585.90 for 1916.

As an example of what this plan means to the companies, let us take the settlement sheets of two of our members for the same month, one having a credit balance, the other a debit balance. The balance sheet of one company shows nine individual debit balances amounting to $1,308.72 and twelve individual credit balances amounting to $225.77. Under the old plan this company would pay out $1,308.72 in nine various amounts while endeavoring to collect from twelve different companies this credit of $225.77. Under the present plan this company merely sends to the association in one check the difference between the debit and credit balances, or $1,082.95, and the entire settlement is made. Another company has a balance sheet showing twenty-one individual debit balances amounting to $113.06, and twenty-four individual credit balances amounting to $467.11. In this case the company has nothing at all to pay out, and at the end of the month the association forwards a check for $354.05. A more simple method of settlement would be hard indeed to find, and that it has taken well with our members is shown by the fact that of the $65,585.90 interchange for the year 1916 there was but $249.29 due the association December 1.

On November 1, 1916, the association took over the service work in Pennsylvania formerly carried on by the Eastern and Western Pennsylvania Independent Telephone Associations. The advisability and wiseness of this move can readily be understood. It relieves the companies of the paying of two assessments, reduces the cost in most cases and equalizes it in all, as well as extending the service work to cover all the companies in the state. The report of the state service engineer for 1916 gives an outline of the work for the past year and the plans for the future.

During the past year the association has taken charge of the filing with the Public Service Commission, Bureau of Rates and Tariffs, all the interchangeable rates in Pennsylvania. The secretary's office is now at work on a new issue of Tariff and Route Books, and a new schedule of rates, which will conform to the one now in use by the opposition company. In instances where connecting Independent companies have been purchased by other interests, the connections have been maintained and business handled over such lines is settled through the association.

Like all such organizations the association has had its bumps. It has been belittled, criticised, investigated. It has "gone broke." Those days are past, and through it all the association has grown and prospered until it has become a power in the Independent telephone field. To be a member is vastly to the advantage of any company doing an interchangeable toll business. To be a member means to put behind your company a strength that is recognized. To be a member means that you belong to the oldest, strongest and best organization of its kind, and now, that each member may enjoy to the greatest degree all of these advantages, and that the association may in return enjoy to the greatest degree the co-operation and support of its members, each member is requested by the executive committee, through the secretary, to place upon their stationery:

MEMBER OF
EASTERN TRAFFIC ASSOCIATION
OF INDEPENDENT TELEPHONE COMPANIES

REPORT OF STATE SERVICE ENGINEER W. H. HAY

The Service Department of the Eastern Traffic Association became effective on November 1, 1916, whereby the supervision of service work over the entire state of Pennsylvania was brought under one head.

This report being a part of the annual report of the Eastern

Traffic Association, a brief outline of all the service work done in the state during the year will be given.

From December 1, 1915, to August 1, 1916, the work in the territory of the Eastern Pennsylvania Independent Telephone Association was carried on by C. J. Larsen, service and traffic engineer.

During the same period and for a year prior to December 1, 1915, in the territory of the Western Pennsylvania Independent Telephone Association, the work has been performed by W. H. Hay, service engineer.

On August 1, 1916, Mr. Larsen resigned the position of service and traffic engineer for the Eastern Pennsylvania Association to assume a similar position with the Kansas City Home Telephone Company, of Kansas City, Mo.

At the request of the service committee of the Eastern Pennsylvania Association and in accordance with the action of the service committee of the Western Pennsylvania Association, Mr. Larsen's duties were assumed on that date temporarily by the service engineer of the Western Association in conjunction with his work in the Western territory. This arrangement was maintained until November 1, upon which date, as a result of action taken at the joint meeting of the two state associations in Harrisburg in September, the service committees of both associations were dissolved and the work placed on its present basis.

Following is a resume of the work done and results accomplished under the various conditions above enumerated:

EASTERN PENNSYLVANIA ASSOCIATION

Service work in this territory, with an engineer devoting his entire time and attention to the work, was inaugurated on December 1, 1915, with, as stated, C. J. Larsen acting as service and traffic engineer.

The first step taken was the compilation of a circuit map, which was drawn to the same scale and made to fit accurately with the circuit map of the Western Pennsylvania territory through the medium of making some slight changes in the Western map.

The matter of securing as complete and accurate information as possible for the compilation of this map involved no small amount of labor and necessitated considerable travel, as it was necessary to procure the majority of information on the ground.

The result is a consistently complete and accurate circuit map of the Eastern territory, and, taken with the map of the Western territory, furnishes a circuit map for the entire state of Pennsylvania.

This data is still in process of check and correction, and when final corrections are made, it is considered that this map should be displayed in every office in the territory for the benefit of operations and those handling plant.

Coincident with the gathering of map data, numerous central office inspections were made and much valuable advice and assistance given to member companies.

Special attention was given to the bettering of central office transmission conditions between Harrisburg and Philadelphia and York and Philadelphia, with good results.

With the improvement of toll-line conditions, under way and soon to be completed, taken together with the changes made in Philadelphia looking to transmission gains, transmission between these points will be of a high quality.

In Philadelphia, as stated, exhaustive studies covering P. B. X. equipment, "B" toll trunks and toll cord circuits were made in conjunction with Carl Sharer, equipment engineer of the Keystone Telephone Company, resulting in recommendations which were approved and on which the work is now completed.

Considerable time was spent in laboratory and research work, with the view of obtaining accurate information as to the efficiency of various types and makes of equipment and in determining the efficiency of various circuit designs.

Among other recommendations made, were the following:

Booster battery at Lancaster.

Booster battery and changes in circuit arrangement at Carbondale.

Booster battery at Columbia. Work has been completed on the Lancaster and Carbondale recommendations.

A central office layout and specifications were furnished for the installation of a new board at Lansford for the Carbon Telephone Company.

A similar service was performed for the Bradford County Telephone Company at Towanda in the matter of the installation of a new two-position local battery board.

During the progress of the work, considerable attention was given to the work of operators.

It was observed that wrong methods were being used in the handling of equipment and in the routing of calls. Instruction was given in the manner of using equipment, so as to obtain the highest transmission efficiency. Transmission tests were made and corrected routings were recommended.

In this connection, work was started on the compilation of standard routings for the entire territory. Switching centers were plotted and tentative routing charts prepared for each center.

These routings will have to be verified through the medium of actual transmission tests and traffic studies.

Considerable work of a miscellaneous character was performed in the way of investigating service complaints, giving advice through correspondence and advising in person as to plant, right-of-way and other matters.

In summing up, it can be safely affirmed that much good has resulted from the work done in this period and that toll transmission in the Eastern Pennsylvania territory is on a much higher plane.

WESTERN PENNSYLVANIA ASSOCIATION—OPERATORS' SCHOOL

In the period between March and July, almost entire consideration was given to the holding of a second series of schools for toll and long-distance operators, the first series having been conducted during the latter part of the summer of the preceding year. The Long Distance Operating Rules of the Ohio State Telephone Company, adopted as standard by the Western Pennsylvania Association, were used.

A schedule was arranged and submitted for acceptance to the management of the companies in the towns selected for the schools with the request that as many connecting companies as possible, whether members of the association or not, be invited to participate in the movement, send their operators to the school and provide them with standard rule books.

It is absolutely essential to the success of the movement toward standardization of long distance operating practice for independent lines, that all companies, no matter how small, adopt the standard and insist that their operators adhere strictly to standard practice.

It has been repeatedly observed that a few operators, working at variance, can exert a most demoralizing effect on those who are endeavoring to adhere to standard practice.

All companies were requested to supply operators with standard tickets, especially those relating to the rules governing call orders and relays. To further the adoption of these two classes of tickets, a supply was procured from the Ohio State Telephone Company and distributed over the territory.

It is obvious that if operators are required to observe standard practice, the means to do so should be furnished them.

A set of small portable switchboards loaned by the Kellogg Switchboard and Supply Company were used in the demonstration of the rules. These boards are at present at the disposal of the service department.

School Center	*Company*	*No. Operators Present*	*No. Towns Represented*	*No. Companies Represented*
Oil City,	Petroleum Tel. Co.	68	9	6
Ridgway,	Commercial Union Tel. Co.	22	7	5
Brookville,	Summerville Tel. Co.	36	6	1
Kittanning,	Kittanning Tel. Co.	46	6	2
Pittsburgh,	P'gh & Allegheny Tel. Co.	72	13	3
Vandergrift,	Vandergrift Tel. Co.	12	2	2
Johnstown,	Johnstown Telephone Co.	37	21	6
Clearfield,	Huntingdon & C'ld Tel. Co.	28	12	2
Uniontown,	Tri-State Tel. & Tel. Co.	61	16	4
Butler,	Peoples Tel. Co.	85	13	4
New Castle,	Union Tel. Co. of Erie.	55	20	10
Erie,	Union Tel. Co. of Erie	42	14	8
Meadville,	Meadville Tel. Co.	36	13	9
Total		600	152	62

During the first series of schools, the reason for adopting a standard set of rules was discussed and a general review of the book made. The rules governing recording, building and releasing circuits and passing tickets, orders, etc., were demonstrated. The method, as prescribed by the standard rules for performing these operations, was compared with the various methods which operators had been using, which made clear the advantage to them of a standard system and demonstrated how such a system was conducive to the saving of circuit time. The importance of the use of code symbols and the necessity for a thorough knowledge of all the codes was pointed out.

The second series consisted of work along the same lines, together with oral examinations and written examinations on code symbols. The result proved that operators had applied themselves to a study of the rules. Observations on operators' positions showed a most decided improvement in method, and such studies as could be made indicated a substantial increase in the volume of traffic handled, which, of course, means an increase of toll revenue.

Following each school, operators' positions were supervised and further explanation of the rules, as applied to actual practice, was given. Instruction of this nature is of particular value to the operator, as a clearer conception of a rule, as applied to a concrete case, can be gained.

It is recommended that as much of this class of supervision as possible be exercised by those in charge of traffic.

Another feature of these school meetings, which worked for much good, is the personal acquaintance gained among operators which, from their testimony, is a distinct advantage to the service.

MORSE CIRCUITS.

At the beginning of the year, a considerable amount of new business was developed in the way of leased Morse circuits, which were operated under the simplex system.

Quite a good deal of difficulty was experienced in the operation of a number of these circuits in wet weather, some of them becoming totally inoperative.

A study was made of the situation, insulation tests were made, under both dry and wet conditions and tabulated.

While some minor troubles were located in office installations, the main difficulty was found to be attributable to low insulation, due to the use of pony insulators. This was especially noticeable in mill districts, where the insulator, the arm and the pole were incrusted with a coating of a metallic nature, which afforded a ready path to earth under humid conditions, and was, of course, conducive to high leakage. An undue amount of leakage was also found, under humid conditions, in districts not so exposed, where pony insulators were used.

This is due to the shallowness of the petticoat of the pony insulator, and recommendations were made for the replacement of same with standard toll-line insulators. Where conditions demanded a higher degree of insulation, double petticoat insulators were recommended.

INSPECTIONS.

While completing the school schedule, a number of central office inspections were made, with the idea of ascertaining if standards, as set forth in Bulletin No. 1 Tentative Standards, were met.

Data was obtained from fourteen central offices covering heat coil resistance, cord resistance and current supply.

In the majority of cases, excessive heat coil resistances were found, some coils measuring as high as 30 ohms. The standard specified for heat coil resistance is not to exceed 7 ohms.

Toll cords were found to be well within the limit, viz., one ohm per strand for a new 72-inch cord.

In only four offices was the standard of 225 milliamperes on zero loop for a toll to local connection met.

Reports were made on conditions found which, in most cases, were remedied.

SERVICE COMPLAINTS.

Numerous service complaints were handled, the investigation of which developed a multitude of conditions.

In this connection it can be mentioned that in no small number of cases the trouble was due to the local line or instrument and not to the toll line. And in a number of cases was the fault found to be, not with the equipment, but with the user, in not speaking directly into the transmitter.

MISCELLANEOUS WORK.

Under this head, cases of cross talk conditions were investigated and remedied, a phantom transposition layout was furnished and cases of cable trouble investigated and cleared. Correspondence and other office work has also required considerable attention.

EASTERN AND WESTERN PENNSYLVANIA ASSOCIATIONS

In accordance with the arrangement between the service committees of the two associations, the major portion of the period between August 1 and November 1, 1916, was spent in the Eastern territory, the Eastern Association assuming the greater part of the salary of the service engineer. All expenses of the engineer, when in Western territory, were assumed by the Western Association, together with a stipulated portion of his salary.

The work founded by Mr. Larsen was continued along much the same lines as laid down by him.

A short time was spent in becoming familiar with the work already done. Checking and correction of the circuit map was continued and a general letter was sent out to the member companies of the Eastern Association, advising them of the change in arrangement and placing the services of the engineer at their disposal.

Following this, a number of trips were made over the territory, with which the engineer was entirely unacquainted, for the purpose of becoming familiar with conditions and getting in touch with the organizations of the various plants.

A trip was made to Hazleton for a conference with the chairman of the service committee, for the purpose of outlining the work to be done and establishing a general policy.

On this trip, a number of offices were visited and observations made of the work of operators, in anticipation of the series of operators' schools to be held. The opportunity presented to make an inspection of the toll line between Reading and Meyerstown, which was at the time undergoing general repair by the Bethel and Mt. Aetna Company. That portion of the line which had been gone over presented a splendid appearance in all particulars.

A trip was made to Philadelphia, where a general inspection of local plant was made. A conference was held with A. J. Ulrich, chairman of the rules committee, covering the advisability of starting school work at once, using the Ohio State rule book or of deferring action, until the new rule book, to be issued by the United States Independent Telephone Association, was issued. It was decided to defer action until the new book was published. Observations were made in the toll room at Race Exchange, and additional data, in reference to the Keystone plant, was secured.

A number of the principal switching centers were visited and operating observations made. The result of these observations points, undoubtedly, to the fact that much good will be accomplished by the adoption of standard practice and the training of operators therein.

Following the Harrisburg convention, several trips were made to Philadelphia for various conferences, the object of which was the organization of the work on its present basis.

A trip of general inspection was made over the Consolidated properties from Carbondale to Reading, via Allentown. Toll-line inspection was made over this entire distance and reported on. All central offices were visited and talks on the subject of toll operating practice were held with the chief operators. Observations on operators' positions were made.

A system of traffic supervision is in force in the Consolidated territory, from which excellent results are being obtained.

This property was found to be in excellent condition, generally. Several points of interference were noted in the toll-line inspection, the majority of which are in the process of handling and correction. It was noted that standard toll-line insulators were used throughout the greater part of the toll line covered by inspection.

A number of service complaints were handled both by correspondence and by actual test.

A reinspection of the toll line between Ridgway and Kane was made and reported on. It was for this section of line that a phantom transposition layout was furnished for the purpose of increasing local trunking facilities.

Action was taken with the end in view of securing additional toll circuits between Kane and Warren, in which section there is serious congestion of traffic due to scarcity of circuits.

An inspection of toll line was made between DuBois and Brookville, via Punxsutawney, and tests were made, looking to the elimination of cross talk disturbance.

Recommendations were made, the carrying out of which has eliminated the trouble.

It has been observed over the state generally, that in a great many cases no attention has been given to the resistance of subscribers' loops, in that undue lengths of small gauge cable are used.

A tracing has been prepared and prints distributed, showing the allowable lengths of various gauges of subscriber cable for single and multi-office districts, whereby the maximum of transmission efficiency can be obtained. These prints will be mailed upon application to the state service engineer.

In addition to the duties devolving upon the service engineer, the work involved by reason of the assumption of the duties of secretary of the Western Pennsylvania Association, in January of this year, have been performed, embracing the keeping of the accounts of the association, sending out the monthly bills, handling the collections and caring for the correspondence and other duties in connection with that office.

EASTERN TRAFFIC ASSOCIATION—SERVICE DEPARTMENT

The organization decided on for the service department of the Eastern Traffic Association is as follows:

A state service engineer, whose duties will be the general supervision of service work throughout the state of Pennsylvania. He will conduct operators' schools, perform transmission work, look after the compilation of records, and care for correspondence in connection with the office.

An assistant service engineer, whose attention will be devoted solely to transmission work and kindred subjects throughout the state.

A traveling chief operator, whose duties will be the holding of operators' schools in territory already covered by an initial series of schools. Her work will be in the nature of follow-up work. She will make observations of the work of operators and

act in a general advisory capacity in all matters pertaining to operating practice.

The office of the state service engineer will be in Pittsburgh, at Seventh avenue and Bigelow boulevard.

An office will be maintained in Harrisburg, in the building of the Cumberland Valley Telephone Company of Pennsylvania, which will be the headquarters of the assistant service engineer.

Further headquarters of the service department will be in the office of the secretary-treasurer of the association in Philadelphia, at 421 Chestnut street.

E. L. Hughes, of Bellefonte, Pa., has been engaged as assistant service engineer. He has served for several years as equipment engineer of the Wisconsin Telephone Company, and prior to that was identified with the equipment division of the Central Union Telephone Company, at Columbus, Ohio.

For the past two years he has been engaged in telephone transmission work in an independent capacity on the Pacific Coast.

A number of candidates have been considered for the position of traveling chief operator. It has been decided to close negotiations with Mrs. Nancy D. Baines, of Buffalo, N. Y.

Mrs. Baines has had a number of years' experience in the telephone field with the Federal Telephone and Telegraph Company, of Buffalo, and is at present acting in the capacity of traveling chief operator for that company. She is eminently fitted, by reason of experience and personality, for this position.

A preliminary trip has been made with Mr. Hughes through the northern section of the Western territory and to Harrisburg, Lancaster, Columbia and Philadelphia, for the purpose of introducing him to the field. Enroute, central office inspections were made, resulting in a number of recommendations, which have resulted in the improvement of transmission and service.

The assistant engineer has since made toll-line inspections as follows:

York to Wrightville.
Columbia to Lancaster.
Lancaster to Philadelphia.
Lancaster to Lebanon.
Bloomsburg to Berwick.

A report has been submitted to the United Telephone and Telegraph Company on the Lancaster-Philadelphia inspection.

Some thirty central offices have been visited and inspected and notes made on conditions found together, with recommendations.

The result of these inspections will be submitted to the companies involved at an early date.

The new rule book, issued under the auspices of the United States Telephone Association, is off the press and available for distribution. It is fundamentally the same as the Ohio State book. A comparison of it with the Ohio State book shows the following points of difference:

A change has been made in the method of passing tickets, which results in a change in the form of ticket.

Under the heading "Routes," a change has been made in the preference of circuits.

Some code symbols have been abolished and others added.

The index has been revised.

A number of other changes have been made in the matter of detail in handling calls, reports and orders.

The initial plans for the coming year embrace a series of operators' schools in the Eastern territory to be conducted by the state service engineer.

The traveling chief operator will start her activities in the Western territory, going over the ground already covered.

The assistant engineer will continue his work along the same line he is now pursuing, his field being the entire state.

All work will be scheduled and information as to the location of any of the members of the service department will be available at any of the headquarters before enumerated.

It is the hope that all members of the association will not fail to make full and free use of this department in any situation in which its services may be of value.

The writer wishes to express his thanks to the field at large for the co-operation he has received and to ask that the same hearty co-operation be extended to the service department, whose one aim will be the advancement of the interests of independent telephony.

Second Edition of Telephone Law Book

A second edition of the treatise on the laws of telegraph and telephone companies by S. Walter Jones, Memphis, Tenn., attorney and writer on legal subjects, has appeared. The new volume is the fourth book on litigation written by Mr. Jones since his removal to Memphis from Senatobia, Miss., eight years ago. His other books are on common carriers and on bailments, neither of which has yet been published. He also is author of a treatise on insolvent and failing corporations.

Mr. Jones' first book on telegraph and telephone companies was published in 1906 and until the appearance of the second volume, was the only authority dealing with telegraph and telephone companies exclusively. It has been quoted in many court decisions and briefs filed in telephone and telegraph cases.

Immediately after his removal to Memphis, Mr. Jones became active in his opposition to saloons. His activity first became apparent in the Law Enforcement League and later he was employed by the governor to prosecute liquor cases.

He was educated at the University of Mississippi and was elected to the Mississippi legislature before he reached his majority. While there he was a member of the penitentiary investigating committee which caused the abolishment of the convict lease system and the purchase of the state convict farm at Parchman, which still is used for state prisoners.

Mr. Jones now is a lecturer in the law school of the University of Memphis, besides attending to his private practice. He read a paper on "Efficiency Through Co-operation" before the Southern States Independent Telephone Association's convention.

Louisiana Independent Prospering

The Southern Telephone Company of Kinder, Louisiana, the largest Independent telephone company in the state, has issued $50,000 in bonds to retire its floating indebtedness and make extensions, and a mortgage covering its properties was filed for record. The bonds are payable at the Desha Bank & Trust Company of Arkansas City, Arkansas, and bear interest at 8 per cent.

The company some time ago acquired ownership of the Howell Telephone & Telegraph Company for $10,000 and later purchased the DeQuincy telephone exchange for $6,000. The former company operated exchanges at Kinder and Basile, and owned toll lines to Lake Charles, to Fulton, to Moeling, Oberlin and Oakdale and to Reeves, Martin Tram and LeBlanc.

The line to Fulton is to be extended as far as DeQuincy and other improvements made. The company now operates exchanges in a number of Louisiana towns.

Number of Poles Needed

It is said that about 4,000,000 poles are needed annually for renewals and new lines in the United States and Canada. Well stocked German forests, which are the best managed forests in the world, produce only 250 trees to the acre; the poles now standing (35,900,000) would thus represent all the timber growing on more than 130,000 acres. In Canada considerably less than 100 poles are cut to the acre, so that nearly 500,000 acres of forests have been cut to obtain the poles now in use, and about 50,000 acres are cut over each year to furnish the poles for renewals. That means cutting at the rate of 100 acres a day.—*Bell Telephone News.*

Joint Use of Poles

Conditions of Agreement Where Two or More Corporations Use the Same Facilities

BY L. C. EDDY

JOINT use of property, such as pole lines, by two or more companies, corporations, or towns may be advisable for the following reasons:

1. Half ownership in a complete system is preferable to individual ownership in an incomplete system.
   a. Expense of maintenance is reduced.
   b. Labor of adjusting rental rates is eliminated.
2. Joint use improves the appearance of streets and private property.
3. Methods of construction are safer and of a more uniform character.

Upon contemplating joint use a concern secures from its local agents, the public service commission, or other sources the following information:

1. Exact name of concern owning property.
2. Territory covered by it.
3. Names and addresses of controlling officials.
4. Financial standing of the concern, its affiliations with other interests, and the probability of its desiring joint use.
5. Existence of municipal attachments or attachments of other companies on the property in question as well as their general location, extent, and character.
6. Probability of new construction.
7. Special municipal or town rules regarding erection, care, and maintenance of equipment.
8. Kinds of service and voltages used.
9. Condition of the present property as well as number and size of poles and attachments.
10. Special reasons for or against joint use.

If, after considering these points, the concern decides to follow up the question of joint use, the next step is to make an appointment for a conference with a proper official of the concern. In case the proposition is favorably received steps may be taken to negotiate an agreement by conferences, inspections, or correspondence to answer objections, make additions, explain, and consider. Maps of the territory showing the construction in question are prepared and also specified forms of construction. The latter may be of the standard type used by the companies, unless conditions require revisions. In case many alterations of equipment are necessary to conform to the specifications, ample time is allowed for making these changes; possibly providing for the alteration of a fractional part of the equipment each month or year. Since towns can secure tree trimming rights more easily than private concerns, municipal wires are often found at the tops of poles. Rates are sometimes based on the estimated annual charges on the portions of equipment occupied.

The main items covered by a joint use agreement providing for both jointly owned and rented poles may be as follows:

1. Preamble and names of parties to the agreement.
2. Territory covered by the agreement.
3. Definition of terms.
4. The pledge to joint use.

RENTED EQUIPMENT.

5. Provision that Licensee make application to Owner for specific permits, obtain right of way before making attachments, have right to remove attachments at any time; and that Owner issue permit specifying necessary changes to his property.
6. Agreement by Owner to replace defective equipment without expense to Licensee; each party transferring attachments at own expense.
7. Provision that Licensee bear cost of changes to make room for Owner's transfer of attachments.
8. Provision that Owner offer equipment to Licensee for purchase in case of abandonment; Owner rightfully removing equipment after thirty days' notice, in case Licensee fails to purchase.
9. Rates at which Licensee pays rent, dates of payment, and penalties for non-payment.

JOINT OWNERSHIP.

10. Provision that party make offer of joint ownership fifteen days before beginning erection of new equipment, and get rights of way; each party bearing one-half the cost.
11. Provision for answering of written applications for joint ownership of old equipment within fifteen days; and provision for acquisition of joint ownership, upon Owner's permit, at following terms:
    a. Grant by licensee to owner of joint ownership in equal amount of own equipment if acceptable; each party rearranging own attachments at own expense.
    b. Payment for excess equipment at one-half value, providing that Licensee bear expense of rearranging Owner's attachments thereon and abandon one of two conflicting properties.
12. Provision for exact portion of property occupied by each party unless otherwise agreed.
13. Provision that maintenance and replacement of jointly used property be borne equally by each party.
14. Provision that for taxation each party report jointly used property as undivided half interest.
15. Provision for ninety days' notice to terminate ownership.
16. Provision for attachments to conform to specifications herein.
17. Provision for special instructions regarding construction and equipment.
18. Provision against disposal of agreement to other parties without consent of both parties except that lease or transfer of property, rights, privileges, and franchises is not disallowed.
19. Provision that agreement be not impaired by prior to existing agreements with other parties.
20. Provision that arbitrators be appointed in case of disagreement as to meaning of agreement.
21. Provision for abrogation of existing agreements as to joint use of equipment.
22. Terms of agreement.
23. Provision covering of failure of parties to comply with agreement.
24. Signature, maps, plates, etc.

After the joint use agreement is completed some alterations of equipment are usually necessary. But it is well to remember that to keep the franchise to a pole line a wire must be on it. Removal of all attachments, therefore, is not always advisable. If properly executed, however, the joint use agreement should be profitable and satisfactory.

British Colonial Telegraphs and Telephones

Abstract of a Paper Read Before the Institution of Electrical Engineers in England

BY R. W. WEIGHTMAN

WITH the gradual standardization of materials and plant generally in the Home Department of the British Post Office, and the publication by the department of books of technical instructions, the dominions and colonies have got more or less into the way of accepting Post Office practice as beyond question. There is the feeling that, no matter what the subject may be, the practice laid down for it has been well thought out, and is the result probably of years of experience and of capable and careful research.

Colonial methods vary in many matters of detail from those in vogue at home. The administrations of the dominions send their chief technical officers to see what is being done elsewhere, and to cull from the various systems those features which are the most advantageous for adoption in their own countries. But as the bedrock of it all, British Post Office practice is outstanding.

APPOINTMENT OF ENGINEERS

In the earlier days many of the engineers, and many officers of other ranks as well, appointed in the dominions and colonies, were men who had received their training in the various home services. This still applies to appointments in the crown colonies, but it is only rarely the case now in the dominions. In a general way, any youth starting at a government primary school can, with the aid of government bursaries, pursue his studies through the government high schools until he finally reaches the university college, where he can qualify in a degree of practically equivalent value to the B.Sc. of England. The colonial youth has few opportunities of acquiring a practical training, but this is not so necessary as in the case of students in the heavier branches of engineering. So we find the youths of the dominions qualifying in their respective engineering departments for even the highest positions in them.

There are, however, several colonies in the tropics in which the conditions are so trying that Europeans must have the relief of a change to a temperate climate at frequent intervals. The Colonial Office Leave Regulations wisely make generous provision in this respect as regards some of these colonies, but other colonies with equally trying climatic conditions are not so well off. For the filling of engineering appointments in these colonies the Colonial Office will always look for men at home, and provided that they offer sufficiently remunerative salaries, they need not fear any dearth of applications from men of the right sort for these appointments. But there is a tendency to parsimony in this respect in many of the colonies. In the interests of colonial engineering, and in the higher interests of colonial administration, only the best men should be selected for these posts, and such men will not come forward unless the salaries offered are sufficiently tempting. Low salaries for men in positions of responsibility is false economy.

WORKING STAFFS

With well-trained staffs of European character, the engineers of Canada, Australia and New Zealand are relieved of much of the worry which falls to the lot of the engineers in those countries where the bulk of the labor is black. In Australia there is an arbitration court, established by act of parliament, for the investigation and settlement of labor disputes. Any difficulties of this nature that arise are referred to it, and the award of the court is loyally accepted and acted upon by both sides. In New Zealand there is a board of appeal on somewhat similar lines.

In Canada there is a law of doubtful value, under which employés can apply for a board of conciliation to discuss differences between themselves and their employers.

In South Africa and in most of the Crown colonies the rough labor is performed almost entirely by men of the native races, while generally the positions of control are held by Europeans. In Ceylon the main supply of labor is drawn from the south of India. All positions higher than that of overseer are held by Europeans.

Engineers in all the black colonies are hampered by the disinclination of the natives to work and by their utter lack of a sense of responsibility.

SOURCES OF SUPPLY AND DELAYS IN DELIVERY

Of all the dominions and colonies, Canada is the only one that has made any headway in the manufacture of apparatus and material for telegraph and telephone purposes.

In Australia, cast-iron pipes, stoneware conduits, copper tapes and certain fittings are manufactured in the country. Prior to 1913 practically all the insulators used came from Germany, but insulators of both porcelain and stoneware are now being made within the commonwealth. A fair amount of magneto telephone apparatus and switchboard material is obtained from Sweden, while some of the larger exchange switchboard plant and automatic apparatus come from America. Wire, cable, telegraph apparatus generally, and material of a kindred nature are obtained almost exclusively from Great Britain. It is the rule to invite tenders for all supplies and to give preference to goods of British manufacture. The other dominions and colonies import practically all their plant. This is largely obtained from England, but quantities of apparatus have been supplied from both the continent and the United States.

The great distances these countries are situated from their sources of supply, and the delays in delivery that have taken place, have been serious drawbacks to the smooth working of most of the colonial engineering departments. The author would like to impress upon manufacturers of telegraph and telephone plant the great need there is for the most prompt execution of orders from the colonies. Before the war it was no uncommon thing to hear an engineer say he would not put up with the dilatoriness of British manufacturers, and that he would send his orders to the Continent, and in some instances orders were actually sent there.

In the dominions and in some colonies these difficulties are got over by the establishing of "reserve stores," in which ample supplies are kept to meet all ordinary demands. This is a plan which every colony with any considerable system should adopt in order to minimize delays.

ADMINISTRATION

The methods of administration throughout the colonies are naturally varied to meet the local conditions, but in all the dominions (with the exception of Canada) and also in all the larger crown colonies the telegraphs

and telephones are combined with the postal service of the country, and the postmaster-general is the officer responsible to the government for the proper management of the organization as a whole.

In some of the smaller crown colonies telephone exchanges have been established by private companies; but they are generally on so small a scale that their control falls to the colonial public works engineer, and for anything of a technical nature in which he is not quite sure of his ground he obtains advice from consulting engineers in England.

In the larger crown colonies we usually find an organization on the lines of the Home Post Office. It has been argued that the engineer should be directly responsible to the colonial secretary, but this arrangement would not be likely to work well in practice. It is most desirable that the relations between the head of the department and the engineer should be of an amicable nature. The efforts of the most capable engineering body in the world may be thwarted and the engineers themselves engaged discouraged if there is undue interference and a lack of sympathy and support from the postmaster-general and his staff.

Telephone administration is a complex question. In America, more than anywhere else, it has been studied and developed into a fine art, particularly by the American Telephone & Telegraph Company, whose operations extend over the whole of the United States. This company introduced a new system called the "functional system," in which the organization is divided into three sections—viz., traffic, engineering and commercial—and on the headquarters staff a specially qualified officer is placed in charge of each section. In each division the work is similarly divided; there is an officer in charge of each section of the work, and each is directly responsible to the headquarters chief of his section. The duties and responsibilities of the officers of each section are carefully defined, but they are so correlated that a certain amount of overlapping is unavoidable. This feature of the system is claimed to be one of its chief advantages, inasmuch as it necessitates the full verbal discussion of a subject in all its bearings before it is reported upon, and much time and correspondence are thus saved.

The telephone services of Canada are partly in the hands of the provincial governments and partly under private and rural companies. There is no real competition between the large administrations. The rural companies, are, however, frequently started in competition with the ruling company, and intercommunication difficulties arise. Where a question of interconnection between any company's system and the long-distance lines of another company arises, the Board of Commissioners have the power to direct what shall be done, and they determine the terms as to compensation on the merits of the case.

The construction of rural lines by independent local companies for the purpose of giving telephone service to farmers is much encouraged by the various provincial governments, and in this respect Canada is a shining example to the other dominions and colonies. The regulations of the Saskatchewan provincial government under which these companies are formed are typical. The companies are not allowed to operate their systems within towns or villages. The limits are built to a standard laid down in very complete specifications and instructions prepared by the Government Department of Telephones. Poles for the construction of the lines can be obtained from the government at cost price. The specifications are accompanied by drawings, and they, also, are so comprehensive that but little difficulty is experienced by the farmers in constructing their own lines themselves.

AUSTRALIA

The Australian telegraphs and telephones are a close monopoly under the Post Office.

Under the department's regulations it is provided that lines for public use in country districts which may not be immediately remunerative to the department, may be erected under a system of guarantee, under which the department bears 50 per cent of the estimated annual loss. In other cases the local residents are permitted to erect the lines themselves, to the department's specifications and at the department's expense, provided that the work is carried out at such a cost as will bring it within the guarantee regulations. It is found that the local people can carry out the work at a cheaper rate than the government department, owing to their being in better touch with the local labor supply, and with the transport and other local facilities.

The fullest encouragement is given to persons living in the country to erect their own lines, either individually, or conjointly with their neighbors, for connection with post offices or exchanges, and the department furnishes applicants with all the information they may require, both as to the best means of establishing connections and as to the class of construction best suited to their requirements. The system of administration is one which has been built up with the development of the services, and it may be said to follow "territorial" lines. The department has a complete monopoly of the telegraphs and telephones of the country, and it does not encourage the formation of private companies for the establishment of rural or other lines. Under the Telegraph Act no person or persons may construct telegraph or telephone lines for hire or profit, but there is no hindrance to persons erecting lines for their own use. Many such lines have been put up by farmers in the back blocks of the country where the government does not feel warranted in spending money on lines which offer little prospect of paying their way. Such lines usually terminate in a government office or exchange where they are given connection with the government system.

SOUTH AFRICA

In South Africa the telegraphs and telephones are also under the postmaster-general. Of all the dominions outside Canada, South Africa is the first to adopt the "functional" system. With the advent of the Union the separate administrations were merged in the one central administration, and a system closely allied to the "territorial" was applied to the whole of the Union. With the great development of the telephone system this method of administration was found to be unsuitable, and the "functional" system was introduced about three years ago.

ENGINEERING

There is practically no overhouse construction in any of the dominions or colonies, and the chief difference in the construction of pole lines lies in the character of the pole employed. Where timber is plentiful and there are no local drawbacks to its use, wood poles are the rule, but where it is scarce or not of suitable size or quality, or where it is liable to be attacked by white ants, or destroyed by grass or bush fires, iron poles are used.

White ants abound in practically all the tropical colonies, and while it is usual in such countries to find an indigenous wood which is more or less immune from their attacks, it is not always suitable for use as telegraph poles. South Africa is not what may be termed a timber country, although there are forests of indigenous trees here and there. Among these the "sneeze-wood" is the

only one that will withstand the ravages of the white ant for any length of time, but even this wood is not free from attack. The core of the "sneeze-wood" is almost as hard as iron while yet as flexible as whalebone, and the author has heard of only rare cases in which the ant has been able to eat into it.

These "sneeze-wood" poles served their purpose well in the construction of the lines that were built in the early days. The poles were not suitable either in height or strength to carry more than a few wires, and with the gradual opening up of the country they were replaced with tubular iron taper poles imported from England.

In British East Africa and Uganda there is a "live" pole in use which is perhaps unique in its way. Some years ago a temporary line was erected with poles which when planted unexpectedly took root and became trees. These poles were found to stand much better than ordinary "dead" wood poles, and, benefiting by this experience, the administration built about 1,000 miles of line with this type of pole. They were cheap and they have served their purpose well in the development of the country during a period when funds were limited. They have their disadvantages, however. With improved financial conditions these colonies are now using tubular iron poles.

POLE LINES

There are two types of tubular iron poles with cast-iron bases and wrought-iron taper upper tubes in general use in the crown colonies. In all these poles the cast-iron base is of sufficient length to keep the wrought-iron tube out of the ground when the pole is planted to its proper depth.

One type of pole has its base pointed, the point being solid for about 5 in., so that it can be driven into the ground by means of a special rammer, which is dropped inside the base. The standard type of pole used has a cylindrical cast-iron (parallel) base with square flange at the bottom end to which a buckled base plate is bolted.

Poles of this type are made in a number of standard lengths and strengths. Where the length is 40 ft. or over, the upper part is made in two or more sections. A factor of safety of 2 based on a wind pressure of 17 lb. per square foot is sufficient for these poles in countries where there are no snow and ice accumulations to be taken into account. Where snow and ice occur a factor of safety of 4 should be allowed.

Fig. 1 shows a light pole specially designed for South Africa. It is used on farmers' lines and carries one or two pairs of wires between main routes and the homesteads. It will carry wires having a total lateral stress of about 80 lb. 12 in. from the top. It is probably the lightest and cheapest pole used in telephone practice anywhere.

There is a parallel pole of a more ornamental type, which is used for special street work in South Africa. There is no cast-iron base with it, but it is protected from corrosion at the ground line by means of a sleeve which is shrunk on. It is 26 ft. in length and will bear a maximum load of about 300 lb. at the top when planted 4 ft. in the ground. Where poles of similar type have been planted without the sleeve protection, corrosion has often taken place at and above the ground line.

In some of the crown colonies tubular poles of the type introduced by the Indian government and known as the Hamilton pole are used. A full-length pole is about 58 ft. out of the ground, and it comprises eight sections each 8 ft. long. The poles taper from about 12 in. at the bottom to 3 in. at the top.

The number of poles to the mile varies with the class of line. Twenty to the mile may be said to be the lowest number that is allowed on a light country line, but the author knows lines on which the average per mile is much below this figure. From this the number ranges up to 40 to the mile. The author has had experience of spans up to 800 yds. standing quite satisfactorily for many years. The poles are specially stayed, double with spacing is given on the arms, only one quality and gauge of wire is erected, every care being taken to adjust all the wires to the same dip, and no joints are made in the spans. With these precautions the wires all swing in unison, and there is no trouble.

The stays used throughout these countries are of British standard types, with tighteners and with iron

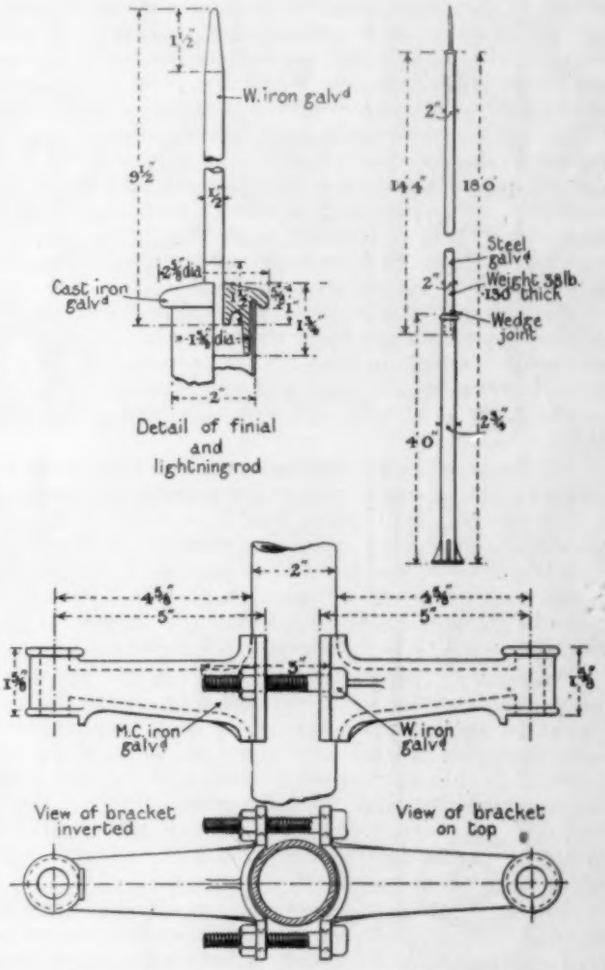


Fig. 1.—Light Pole with Double Bracket (South Africa).

anchor plates which are usually tarred. In South Africa a "Crosby" clip is now used for clamping the stay wires at the pole and also at the tightener.

Where iron poles are employed near the sea they can only be preserved from corrosion by being frequently painted or tarred. The author has tried every kind of paint for this purpose, but he found none to stand any better than coal tar applied in the heated state. Reinforced concrete poles would be more serviceable than iron in these situations, but the weights of these poles in proportion to their strengths are against them for lines where the difficulty of transport is a serious factor.

Hollow reinforced concrete bases made in moulds locally and fitted with wood tops are sometimes used. Discarded railway rails are also used, the rails being set with the web of the rail at right angles to the direction of the line.

In Canada, wood poles and arms are used. There are no iron or reinforced concrete poles in use.

The main telephone lines follow the public roads. Short cuts across country, except in the case of rural companies' lines, are resorted to only in special cases and where the right of way can be obtained.

These wood poles are generally of cedar. The standard lengths of poles used vary considerable. The standard of the Bell Telephone Company is 35 ft. With other administrations 30 ft. to 35 ft. is usual for exchange construction and long-distance lines, while on their rural lines 20 ft. and 25 ft. lengths are commonly employed.

The practice in respect of the providing of earth wires on poles varies, but it is nowhere the rule to ground wire every pole. The spacing of the poles is varied in the different administrations, and it varies with the class of line. One system, which is typical, allows 40 poles to the mile on heavy routes, 36 to the mile on less heavy, 32 to the mile on lighter, and 30 to the mile on light routes.

Stays and struts and overhead stays attached to stubs where there is obstruction to the use of ordinary stays, are liberally used on angle and terminal poles. Anchors of both wood and iron are used.

Both wood and iron poles are used in Australia, the selection depending generally upon whether or not dangers from white ants or bush fires have to be met. Several types of iron poles are employed, the principal being the Siemens taper pole with cast-iron base and screw ring joint.

All the wood poles used are obtained from trees indigenous to the country. Up to the present no treatment for the prevention of decay has been applied, but the question of introducing creosoting plant for this purpose at the larger centers is under consideration. In districts infested with white ants all poles are protected from their attacks by the application of a solution of arsenic (1 lb.) and caustic soda (2 lb.) dissolved in 1 gallon of water.

Poles vary from 20 ft. to 75 ft. in length and from 5 in. diameter at the small end and 8 in. at the butt, to 12 in. at the small end and 20 in. at the butt. The minimum height from the ground of the lowest wires along the road is 12 ft. and at the road crossings 18 ft. All wood poles are provided with lightning conductors of No. 8 galvanized iron wire. Where poles are stayed anchor logs not less than 9 in. diameter and 4 ft. in length with 4 in. square washers are used.

New Zealand has a greater variety of types of poles than most countries. Poles of wood, tubular iron, reinforced concrete, and discarded railway rails are in use. The wood poles are mainly got from indigenous trees, but timber generally is scarce. A good many poles of ironbark wood have been obtained from Australia. There are no white ants in New Zealand and poles are but rarely damaged by fires. The standard lengths of wood poles in use are 18 ft., 20 ft., 25 ft., 30 ft., 35 ft., 40 ft. and 45 ft., and the poles are not ground-wired.

Tubular iron and steel poles have come more into use within the past few years. They are used in the larger towns for telephone exchange distribution purposes, also in the lighter sizes on some light country lines.

The reinforced concrete pole used is of solid construction, the cross-section being rectangular. The dimensions and strengths of two typical 25 ft. poles are:—

1. 7 in. by 4 in. at the butt, tapering to 3½ in. by 3 in. at the top. Weight 490 lb. Working load 150 lb.

2. 7 in. by 5½ in. at the butt, tapering to 5 in. by 3½ in. at the top. Weight 720 lb. Working load 250 lb.

Hollow concrete poles are not employed.

Poles of 52 lb. and 70 lb. discarded railway rails are largely used, and are said to make splendid lines. Poles of this type have been used for a great many years, and are so favored that they would be in general use but for the fact that they are not available in the quantities required.

POLE-FITTING

There are many types of iron brackets and arms available for use with iron poles, and South Africa may take some credit for having helped to evolve a number of useful improvements to these fittings.

The bracket shown in Fig. 1 is of malleable cast-iron. It is typical of many other patterns which vary mainly in the size of the seat.

For a wood arm, Jobson's combination bracket is a useful fitting. This was originally made with straight fixing bolts, and it is still used in this form by some administrations. In South Africa it gave much trouble owing to the arm shrinking in dry weather and causing the clamp to become loose. On angle poles this often allowed the arm to cant and even to twist right round. To prevent this and to enable the clamp to be tightened up on the pole independently of the arm, the author's old chief in Natal, the late T. T. Hardaker, devised the shoulder bolt shown in Fig. 2.

With the introduction of the tubular iron arm by the Post Office in England several of the colonies quickly took it up, and with some of these it is now the standard

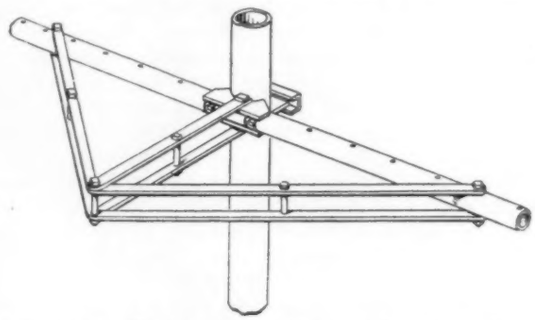


Fig. 2.—Combination Bracket with Shoulder Bolts for Tubular Iron Pole.

arm. The spacing between insulators and arms is somewhat varied in the different colonies.

When the author adopted tubular arms in Natal he designed and introduced a number of fittings, such as tie rods, arm supports, cross-arms, back braces and cage frames. Where wires are terminated on an 8 or 12-wire arm the arm is back braced. The end of the pole arm is sometimes scalloped to take the cross-arm which is held in position by means of an eye-bolt. The head of the eye-bolt is slipped inside the main tube, and is held by the first insulator spindle on it. Where the end of the pole arm is not scalloped a cross-arm holder is used. Where 8 or 12-wire cross-arms are used they are back braced to the pole arm by means of two strands of $\frac{7}{16}$ steel wire (galvanized) each with a small swivel tightener.

A four-sided tubular iron frame is used on a junction or leading-in pole carrying wires in four directions. These frames are built up in the form of a cage and the design is such that the lineman has plenty of elbow-room.

The sizes of tubular arms most commonly used are

all 1 1/16 in. diameter by Nos. 7, 9 and 12 S.W.G. thick. They are always galvanized. Tests show that the No. 9 gauge tube is sufficiently strong for all practical purposes.

If line construction is good the maintenance costs will be low, and the great advantage of freedom from faults is gained. Probably in no other class of engineering is the success of a work dependent upon factors of such low values mechanically as in telegraph and telephone engineering.

Double-shed white porcelain insulators of Post Office types are generally used in these colonies and in South Africa. On the farmers' lines in South Africa a small single-shed porcelain cup is used. The spindles and cupholders used with these cups are generally of the standard types adopted by the British Engineering Standards Committee, although for light conductors single and double J and also U cupholders of lighter patterns are used.

Glass insulators so much used in the United States and Canada, where the climate is dry, are not used to any extent in the crown colonies, and not at all in South Africa. Some insulations tests of porcelain and glass insulators of the same size and shape gave an average of 50,000 megohms for the former and 3,500 for the latter. Glass insulators are much affected by changes of temperatures and are liable to fly to pieces even when these

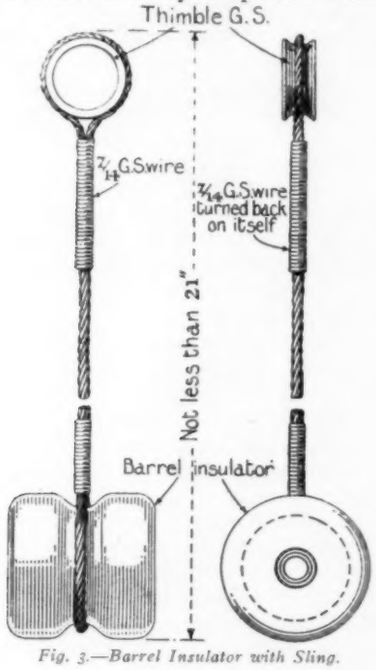


Fig. 3.—Barrel Insulator with Sling.

changes are comparatively slow. Porcelain insulators are less affected by temperature changes, and when used in the standard manner on screwed spindles with elastic washers of felt or india rubber they are quite reliable. The insulation of a line is a matter of the first importance. The best insulator gives the best service, and the author is prepared to say that no insulators made are to be compared either for insulation, strength, or general serviceableness with the British Post Office standard porcelain types as made in England.

In Canada the arms generally used are of British Columbia fir. A 6-wire arm used by the Grand Trunk system is 7 ft. long by 4¼ in. by 3¼ in. On telephone lines 6 and 10-wire arms are used, but the 10-wire is the general standard. The spacing is usually 12 in. between cups, with 18 in. at the pole, and the arms are generally spaced 24 in. apart.

Both porcelain and glass insulators are used on both telegraph and telephone lines; but, owing to the wonderful dryness of the climate, glass is found to give sufficient insulation. Where high insulation is required, porcelain is used.

In Australia wood arms and single iron brackets are used on both wood and iron poles. They are usually of 3 in. square section with the edges chamfered. The standard lengths vary from 42 in. for 4 wires with 9 in. spacing to 96 in. for 10 wires with 9 in. spacing.

The standard insulators used are of porcelain or stoneware of double-shed type and made in two sizes. They are threaded internally and are usually carried on wood pins similarly threaded, although iron spindles with lead-screw tops are also used.

The "cheaply constructed line" is a novel feature authorized by the Commonwealth department. Such a line is only erected when the cost of a standard pole line is prohibitive, and it is erected on trees, saplings, scantlings and fences. Owing to the low efficiency of the insulation this class of line is used almost exclusively for local telephone services. Where the wire is attached to a tree a sling insulator as illustrated in Fig. 3 is used. Where the wire is carried on fencing posts barrel insulators of the same type are employed.

In New Zealand the question of pole arms is a vexed one owing to the scarcity of suitable timber for the purpose. The arms in use are mostly of Rata wood, which is hard and suitable in every way, but difficult to obtain. The insulators used are of standard Post Office white porcelain types. Iron arms are not used. Insulators made from a black composition have been tried, but have not given satisfaction.

LINE WIRE

In the Crown colonies and South Africa galvanized iron wire is not so much used now, although for minor telegraph circuits 200 lb. and 400 lb. wires are still employed considerably.

For long-distance telegraph lines 150 lb. and 200 lb. copper wires are used. Practically all telephone circuits are of copper. In South Africa 70 lb., 100 lb., 150 lb., 200 lb., 300 lb. and 400 lb. gauges are used according to the grade of service required. The telephone trunk wires are generally erected on the twist, and on main lines and as a matter of economy both telegraph and telephone circuits are erected on the same poles. In cases where separate pole lines are erected for telephone circuits the wires are transposed on U cupholders.

Bronze wire usually 150 lb. per mile is employed in some colonies for long spans, but not largely, and copper clad steel wire has also been used to a slight extent. In two colonies where this latter wire has been tried it has quickly broken down owing to moisture penetrating the copper, probably through defects caused in the handling. Where it is erected near the sea the life of the wire is very short indeed.

In situations where the insulation of open wires may be lowered from any cause, hard-drawn copper and bronze wire with a special insulation to a Post Office specification is sometimes used.

The Britannia joint is commonly used for jointing both iron and copper wires, but here and there McIntyre sleeves of both oval and twin tube type have been introduced. The author has all along favored the wire joint, as with native workmen there is less risk with it. In inexpert hands the sleeve is liable to be badly twisted and the wire damaged. On the other hand, with the sleeve the soldering iron is dispensed with, and this is certainly

a great advantage in a country where the work is in skilled hands.

In Canada copper and iron wire are both used largely on both telegraph and telephone systems.

The open telephone circuits in Canada are transposed. The system of transposition is based on that of the American Bell Telephone & Telegraph Company, and is worked out in a very thorough manner. Phantom telephone circuits superimposed on physical circuits are largely used and special transpositions are arranged in these cases.

McIntyre sleeves are employed generally for making joints. On copper wires copper sleeves, and on iron wires steel sleeves, and also tinned copper sleeves are used.

There are a few farmers' lines on fences in Canada. The fences generally consist of three separate strands of barbed wire on wood posts, the top strand being 15 in. to 20 in. from the next. The top wire is used for the line, and it is not usually insulated in any way, but merely stapled to the posts. The earth is used for the return. In dry weather no great amount of leakage takes place, but in wet weather the speech-transmission value of such lines is very poor. These lines are not permitted to be joined up to public exchanges.

In Australia for main trunk telephone circuits copper wire 300 lb. and 400 lb. per mile, and for minor trunk

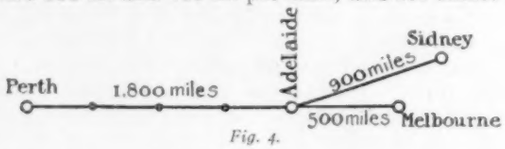


Fig. 4.

circuits which connect with the main trunk system 100 lb. and 200 lb. per mile, is used. For other minor trunk lines and also for telegraph circuits, other than those on which fast speed Wheatstone is employed, 200 lb. and 400 lb. galvanized iron wire is used. For the high-speed circuits copper wire is provided. Phosphor bronze wire is used for subscribers' circuits on telephone exchange systems, so also is copper wire of 50 lb. and 70 lb. gauges. All joints are made by means of McIntyre or other approved type of sleeve.

In New Zealand copper, iron, and bronze line wire is used. Copper wire of 100 lb., 150 lb., 200 lb., 300 lb., and 400 lb. is employed generally for telephone circuits of importance, and also for long telegraph circuits. Iron wire is being less used than formerly. Bronze wire of 40-lb. gauge is used on exchange distribution lines. The McIntyre sleeve is not used, all joints being of the "Britannia" standard type. Fence wires are often used by the farmers for telephone purposes as in Canada.

In Australia morse sounder and morse printer apparatus is used on the minor telegraph circuits worked on the closed-circuit system Morse duplex and quadruplex are employed on the busier circuits. Telephones are now frequently used where formerly morse apparatus would have been installed. The introduction of either the Murray or Western Electric multiplex or the Baudot system is under consideration. The Wheatstone automatic is in constant use for both ordinary and press work between the main centers and this system has recently been extended. It is found to be quite reliable and satisfactory. Creed apparatus was introduced between the eastern and western states in 1913, and has been in regular use for the past two years. The arrangement is shown in Fig. 4. Repeater stations are installed at the points dotted between Perth and Adelaide. Standard duplex repeaters are used.

TELEPHONE SYSTEMS

Throughout the Crown colonies, and also in South Africa the natives are not sufficiently concerned in commercial pursuits to use the telephone. Statistics do not usually make allowance for this, and consequently the telephone development in these countries does not compare favorably with that of European countries.

In almost all these colonies the telephones are in the hands of the government. In Trinidad the telephones are in the hands of a private company. The principle exchange has a central-battery manual multiple board equipped for 1,200 subscribers, with a separate magneto trunk section.

At Suva, Fiji, a multiple magneto board on the "ring through" system is about to be installed. This will have an ultimate capacity of 1,200. The line signal is a plug restoring drop indicator, and the clearing signal a circular star-type galvanoscope indicator.

The author is aware that there are objections to the adoption of this system in a large exchange, but he is of opinion that for exchanges in countries where the commercial conditions are not so pressing as in large centers the "ring through" has its advantages.

At Colombo, Ceylon, a magneto lamp-signaling multiple board is in use, equipped for 1,400 subscribers. At Hong Kong and Singapore, the local systems are owned by a private company. At both places magneto lamp-signaling multiple boards with automatic supervisory lamp signals are in use. The ultimate capacity in each case is 5,000. The main cables from the exchange are underground with overhead dry-core cable distribution to open wires.

There are no automatic exchanges in any of the Crown colonies. Not only are insulation difficulties felt to be a bar to their introduction in the damp climates of these countries, but the need for the employment of highly skilled mechanicians to look after the plant is regarded as another obstacle.

The distribution at the larger of these exchanges is generally by means of cables from the exchange led to pole lines through distribution and protector boxes fixed to the poles. The subscriber density is so low that service by direct cable can be given but rarely. Business premises and dwelling houses are not so cramped as in European towns; they are more open and scattered, so that the direct cable service or the block and alley system of distribution cannot be applied to any extent. 10-lb. and 20-lb. conductors are employed.

Where the distribution is by means of armored cable the lead-sleeve joints are usually in cast-iron boxes for protection and to preserve the continuity of the armoring. Where aerial lead-covered dry-core cable is used it is supported in the usual way on steel messenger wires.

For small exchanges the author prefers the underground armored cable. It can be used with complete safety. The upkeep is practically nil, all the work of erecting messenger wires and the heavy stresses they bring upon the poles are obviated.

The termination of cables in a building usually follows Post Office practice, the cables being connected to distribution cases by means of a link of enamel and cotton-covered lead-sheathed cable made airtight with beeswax.

Aerial rubber cable has been tried in some of the tropical colonies, but it is liable to break down owing to the heat and rain to which it is exposed.

The pole distribution-boxes in use are usually of cast-iron, having two compartments, one at the back for

the dry-core cable which is sealed up with compound when the paper-covered wires have been soldered on to their tabs. The other compartment is fitted with ordinary carbon discharges and fuses. The leading-out cables from the pole boxes are single-pair enamel and cotton-covered and lead-sheathed.

Special measures are taken in the manufacture of all apparatus for use in the hot humid climate of the tropical colonies to keep up the insulation of all electrical parts, and precautions are taken as far as possible to prevent insects getting inside the instruments.

In South Africa every town and village of any importance has its exchange, and a large trunk system has been developed. At present the longest connections in regular use are about 500 miles in length. A speech efficiency equal to 30 miles of standard cable is aimed at, and inter-communication is given to all stations that come within this limit. Loading coils have not yet been introduced, but they will be employed when the time arrives to consider the longer trunk lines between the Cape and Transvaal main centers.

The Durban exchange has a central-battery manual board, with an ultimate capacity of 7,200. The distribution in the busy area is by dry-core underground cable. Connection is given with other towns in Natal and in the adjacent provinces through the government trunk system.

At the principal government exchanges central-battery manual boards are in use, the largest being that at Johannesburg, with an ultimate capacity of 9,000 lines. Similar exchanges of rather smaller capacity have been installed at Cape Town and Pretoria, and also at about half-a-dozen other towns on the Witwatersrand. At nearly all other towns magneto boards on the "ring through" system are employed.

Magneto boards with automatic clearing are in use at certain exchanges. With this system a condenser is placed in the telephone circuit of the subscribers' instrument. When two subscribers are through, potential is on both subscribers' lines through the supervisory relays. When the telephones are hung up the loops are closed, the supervisory relays are energized, and the clearing signals operated.

Telegraph circuits are superimposed on telephone wires where it is advantageous to do so, and phantom telephone circuits are obtained wherever possible.

The installing of an experimental automatic exchange was decided upon some time ago, but the war has interfered with this project, as it has done with the telephone development generally in the country. Both wet and dry cells are used on magneto telephones. The author always used wet cells in Natal, as he found them more reliable and economical than dry cells.

The underground cables and distribution methods vary, but the work of co-ordinating the methods to one standard has now made great headway. In present-day practice underground cables having 10 lb. conductors are in use. Heavier conductors are employed where required, also composite cables having large conductors for long-distance circuits.

Distribution is carried out both by underground direct cable, and on the block system from high poles by means of both dry-core cable and open wires. In both cases the internal distribution is through lead-covered cables to distribution frames or cases, and thence to the subscribers' sets. Open-wire distribution is on somewhat similar lines to those already described as in use in the Crown colonies.

The practice of drying out paper cables by means of dry-air pumps fitted with desiccators is followed in some of the Crown colonies, but the tendency now is to adopt the method of jointing described later under Canadian practice. In South Africa portable dry-air pumps are provided for use only when a definite fault appears.

In Canada the Bell Company has central-battery manual systems in its larger exchanges, and in exchanges below 500 or 600 lines uses magneto boards. It has no automatic exchanges.

The practice of the Manitoba Government Department is on similar lines. Their magneto boards are fitted with plug-restoring line signals of the eyeball type.

In Alberta and Saskatchewan the government exchanges at Calgary, Medicine Hat, Lethbridge, Regina and Saskatoon are equipped with the Strowger automatic system, as is also the municipal exchange at Edmonton. This latter exchange was started in 1907 with a 500-line installation, but is now for 10,800 lines, of which 9,300 are connected. It is spread over four exchanges and an area of roughly 20 sq. miles. All other exchanges in these two provinces are magneto except two central-battery manual exchanges at Saskatchewan.

Dry cells are used on all subscribers' magneto instruments throughout Canada.

The block and alley system of distribution is generally followed. The company are working towards an all-cable distribution in their exchange areas. On many small exchanges the main distribution is carried out entirely with aerial dry-core cable.

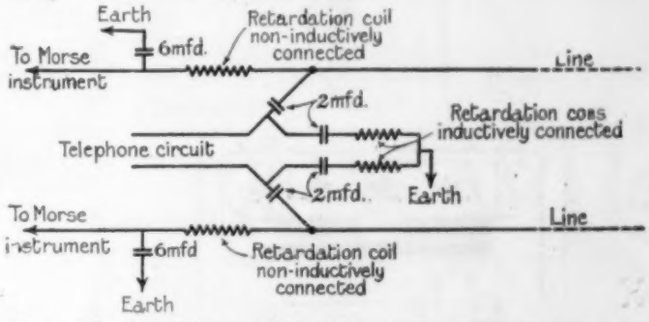


Fig. 5.—"Composite" System of Superimposing Two Telegraph Circuits on Telephone Pair.

The methods of protection at subscribers' stations vary somewhat, but generally they conform to American practice. Circuits are divided into three classes—viz., unexposed, partially exposed and exposed. Unexposed stations are those that are not exposed to lightning or to contact with lighting or power circuits. A station is not considered exposed to lightning if it is served by aerial wires on poles for a distance of less than half a mile. At such stations no dischargers or fuses are provided. Partially-exposed stations are those that are subject to lightning, but not to contact with lighting or power wires. Carbon dischargers are fitted at these stations. Exposed stations cover all others, and carbon dischargers and fuses are fitted at these stations.

Superimposed telegraph circuits which are usually leased to the telegraph companies are arranged on both "simplex" and "composite" systems. The "simplex" is the well-known system which gives one Morse circuit superimposed on one telephone pair by means of repeating coils. The "composite" gives two Morse earthed circuits, which can be worked either single or duplex, and one metallic telephone circuit on one pair of wires. The theoretical connections of a terminal composite set are given in Fig. 5. For telephone signaling over circuits fitted with "composite" apparatus a special ringing set is provided. The same ringing set is sometimes used on the

"simplex" system. The telephone transmission loss due to the introduction of a repeating coil at each end of a telephone circuit on the "simplex" system is equal to about one mile of standard cable, while the loss on a circuit equipped with a "composite" set at each end is equal to about ¾ mile of cable.

The minimum speech efficiency on the long-distance circuits ranges from 30 to 36 miles of standard cable. The general dryness of the climate contributes to a high standard being attained.

Long-distance lines are equipped with lightning discharges on the poles at suitable intervals, and where these wires are taken into an office or testing station it is a common practice to place the dischargers one or more poles away on each side of the office. The "Chapman" discharger shown in Fig. 6 is a type much used for this purpose.

On main distribution frames carbon dischargers and heat coils are used by the Bell Company, but carbons and

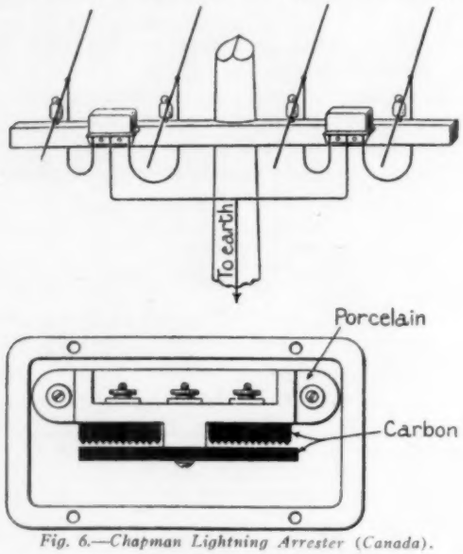


Fig. 6.—Chapman Lightning Arrester (Canada).

fuses are more generally provided by other administrations.

There is no through communication yet between eastern and western shores of Canada. There is a break of 600 miles between Fort William and Kenora, in which there is no telephone line at all, and the Rocky Mountains form another break between Alberta and British Columbia. The longest lines regularly in use in Canadian territory are those between Montreal and Windsor and Montreal and North Bay, distance of about 600 miles. Loading coils are in use on both open-wire and underground sections of the long-distance circuits. Communication is given with a large number of places in the United States through the trunk lines of that country, the longest distances being Montreal to San Francisco, 3,800 miles, Toronto to San Francisco, 3,200 miles, and Montreal to Vancouver, via the American trans-continental line, a distance of about 4,000 miles.

The telephone development of Canada is higher than that in any of the other dominions or colonies. For the whole of the country the average number of telephones per 100 of the population is 6.5. In British Columbia the average is as high as 11, while in Manitoba and Alberta the figures are 10 and 8 respectively.

Australia.—Probably no country in the world has taken up automatic telephony so whole-heartedly as the Commonwealth of Australia. In 1912 the chief electrical engineer personally investigated the systems then in use in America and Europe. His report, dated October 10, 1912, dealt in a very thorough manner with the comparison which may be made between manual and automatic systems. Since then important headway has been made, full automatic equipment has been installed in 10 exchanges, the largest of which is Perth with over 3,000 subscribers. Six other exchanges are in course of construction or approved, tenders have been invited for a further 18, and 14 others are under consideration. The exchanges so far opened are all equipped with the Strowger system, but both the Siemens and the Western Electric Company's systems are to be tried.

Both central-battery and magneto exchanges are in use. Distribution from all the larger exchanges is effected by means of underground cables. On very small exchanges open-wire distribution is adopted. A good deal of aerial cable of both the dry-core and rubber types is installed, but its use is rigidly prescribed, as its erection is not economical in the commonwealth where the estimated five years capacity is 50 pairs or over. On exchange distribution it is the practice to serve subscribers' premises by underground cable wherever this is warranted. Where cables are led to open wires for distribution they are connected through a pole distribution-box several types of which are in use. The practice laid down for the provision of protective apparatus is well thought out. At junction points between exposed and unexposed cables and wires, fuses and arresters are generally installed. Outside protection against lightning is not usually adopted, apart from exchange distribution lines, unless in the opinion of the local engineer such is warranted.

There is a fairly extensive trunk system within the individual states, but the only capital cities as yet connected are Melbourne-Sydney (595 miles) and Melbourne-Adelaide (487½ miles). On both of these circuits Morse duplex is superimposed and worked regularly. Proposals have been put forward for a Sydney-Brisbane trunk circuit. On certain of the main lines the trunks are twisted, but on the other main lines and on country lines the transposition system is in use, and this system is likely to be continued. Loading coils have not yet been introduced into the commonwealth. The percentage of telephones to the population at the end of last year was 2.721.

New Zealand was very early in the field, and many of the exchanges installed between 20 and 30 years ago are still in operation. Many of the larger exchanges have become quite inadequate for present requirements, and the question of substituting more efficient systems has been before the authorities for some years past. The introduction of the central-battery manual system was contemplated, and three Western Electric central-battery exchanges were installed, but the administration hesitated to introduce this system generally in view of the development of automatic systems. In 1911 the chief electrician of the department recommended the adoption of automatic exchanges for several of the principal towns, and the full-automatic system was decided upon. Contracts were entered into for exchanges for the Wellington and Auckland telephone areas, and for separate single exchange installations for Masterton, Hamilton, Oamaru and Blenheim. Masterton and Hamilton are being equipped for 800 lines, and Oamaru and Blenheim for 600 lines. The ultimate capacity of each of these exchanges is the same—viz., 1,800 subscribers' lines, and 200 junction lines for special services.

At Wellington the system will have three main exchanges with immediate equipment respectively for 4,000,

2,500 and 600 lines (ultimate capacities 8,000, 4,000 and 2,000 respectively). In addition three sub, or "satellite" exchanges off the largest main exchange with capacities from 200 to 600 lines are contemplated, the ultimate capacity of the whole system being 20,000 lines, and accessory junction lines. At Auckland the arrangements will be on similar lines with four main exchanges, and two "satellite" exchanges, the total ultimate capacity being the same as at Wellington. Each system will have a common manual toll board situated at the principal exchange in each case. Subscribers' meters are not being installed at present, but provision is being made so that they can be put in either in part or whole at any time, and the meters when installed will register effective local calls only. A time alarm-signal is provided to indicate an earthed line, and also to show when a subscriber's line is being wrongfully held up. All exchanges are arranged for main line service, private branch exchange service and for party line service. There is every confidence that the system will adequately meet the very varied telephonic conditions of the country, and it is not too much to say that before many years have passed all the important exchanges throughout the dominion will be automatic.

There is a considerable network of trunk telephone circuits. Nearly all outlying exchanges are connected with their larger centers, and some of the latter are interconnected. The longest speaking circuit is that between Wellington and Auckland, a distance of about 420 miles. This is obtained from two 400 lb. copper wires which are used for quadruplex telegraph purposes during the daytime. At night-time—after 6 p. m.—they are used as a telephone trunk circuit. In many cases telegraph circuits are superimposed on the telephone wires, and phantom telephone circuits are also obtained. The standard of speech on trunk lines is the equivalent of 30 miles of standard cable, and the introduction of loading coils is under consideration. The number of telephones per 100 inhabitants is 4.6.

Green to Support Government Ownership

Representative Green of Iowa, member of the house ways and means committee, has declared himself in favor of government ownership of the telephone lines in the District of Columbia.

Judge Green looks on the Lewis bill, which proposes the postoffice department shall take over the telephone lines in Washington, as a measure worthy of support.

He will not only support it, but he will take an active part on the Republican side in pushing it forward. As Judge Green will serve in the new Congress, which begins March 4, this is important.

The bill cannot be passed in the short session and Mr. Lewis will go out of office at the end of this session.

For some time, Judge Green has been studying the telephone and telegraph systems and he is preparing a bill for the nationalization of the telephones. He hopes to see the government take over the telephones of the country and the postoffice department ultimately to have jurisdiction over telephones and telegraphs.

As for ownership of the telephone lines there, he looks on it as a first step toward public ownership of the telephone system on a national scale.

He believes the taking over of the lines there would be watched with interest the country over and that the government would get valuable knowledge and experience while the people of Washington would get lower rates.

"I am in favor of the government taking over the telephone lines in the District of Columbia," said Judge Green. "I think this is probably the best way to begin public ownership of the telephone. I regard Representative Lewis' bill as an excellent one.

"A start could be made here and the capability of the government to conduct and manage telephone service could be tested.

"I have no doubt that the government can take over the lines in the district and reduce the rates greatly while giving excellent service. The telephone system could be operated as an adjunct of the postoffice department and the government would have a big advantage in this way.

"The two services, the postal and the telephone, ought to work together and support each other, as well as the telegraph system."

The experience of various foreign governments and cities with the telephone and telegraph is being studied by Judge Green. Mr. Lewis, too, is going into this exhaustively.

In the matter of the telephone service supplementing the postal service Judge Green thinks it would tend to facilitate the postal service. The telegraph system would do likewise, in his opinion, if the government owned it.

That the public ownership of the telephone system in the national capital and the broader proposition of ownership the country over is certain before long to become a live subject in congress and out of it is the belief of Judge Green.

Omaha Strong on Telephones

Telephone development in Greater Omaha during the year ending December 1 placed the city first in the world in number of telephones in proportion to population, it is claimed in that city. More than 3,700 telephones were added in Omaha during the year, as compared with 3,030 in 1915.

According to the best figures now available from the work of its engineers, the Nebraska Telephone Company will spend approximately $1,000,000 in Greater Omaha in new construction during the year 1917.

About half of this sum, or $500,000, will be spent in the laying of underground conduits, extensions in pole lines, the installation of new cables, and additional equipment for subscribers.

About $500,000 will be used in the construction of the new telephone headquarters building at Nineteenth and Douglas. Work on this fifteen-story structure is expected to be pushed rapidly. The contract for the steel has been let and ground broken.

This building will be occupied as the headquarters for the Bell Telephone companies operating in Nebraska, Iowa, Minnesota, North and South Dakota.

Fourteen hundred people are employed by the Bell Telephone system in Omaha, with an annual payroll of $900,000. The gain in number of employes for the year was 200.

December 1 the area served from the Greater Omaha exchanges had 43,581 telephones.

Commercial Shortcomings of Engineers

Digest of Address Before Springfield, Illinois, Engineers January 12, 1917

BY ARTHUR KNEISEL

Arthur Kneisel,
Secretary of the American Association of Engineers.

THE subject "Practical and Commercial Shortcomings of Engineers" is really the basic idea of Income vs. Outgo. If engineers had no practical or commercial shortcomings, there would be no reason to discuss "Income vs. Outgo," for there would be so much difference between the two that there would be no comparison—instead of no distinction.

There is some definite reason for the failure of increase in compensation to engineers in proportion to the percentage increase in compensation secured by skilled and unskilled labor as well as by certain professions—notably the legal and medical. Possibly the engineer has not devoted the same time or brain effort in finding a reason and consequently a remedy for the present status of the engineer.

Now, what is this status?

1—The function of the technical engineer is understood by few individuals who have not studied the science. It is not the fault of the layman that he thinks of the engineer only as a fireman who was promoted.

2—The engineer himself seldom gets a broad idea of engineering. He is more vitally interested in some limited branch of the science in which he becomes so proficient that to him it is the most important work in the world.

3—The engineer has no recognized champion to inform the public that a catastrophe was caused by someone's failure to live up to specifications written by engineers, rather than by an error made by engineers. Consequently the engineer is a convenient person to blame for any and every fault in a project involving engineering.

4—Since the compensation of the average engineer (numerically speaking) is far below that which he expected to earn later when he took up the study, the engineer almost holds his profession in contempt. A technical society some years ago endeavored to find the average compensation of engineers several years after graduation. There results showed the average to be above $3,000 per year. This high average was due to the failure of the low salaried engineer to reply to the inquiry. The average salary of engineers of five or more years' experience is nearer $1,800 than $3,000 when idle time is considered. If the engineer does not respect his profession how can he expect the respect of the layman, who has no knowledge of his work except that supplied by the engineer himself?

5—The engineer seldom "finances" his business. He does not know his investment, development cost, insurance, present value or his junk value.

6—He takes very little interest in civic activities; in fact he seldom votes or takes a definite stand on any public question. Has the engineer any more right to shirk his duty as a citizen than has any other member of present day society? Who is better fitted than the engineer by training and habit of research, to build up, analyze and strengthen laws which pertain to public health and welfare? Then why are there no engineer members of Congress, of the state legislatures and of municipal councils? Has he not the same right to a place there and is it not as much his duty to be there as the doctor, the lawyer and the saloonkeeper?

7—The engineer is an individualist to that extreme that he often fails to see the wisdom of cooperating with anyone else in or out of his profession. This is a strange paradox. For in his work each detail must co-ordinate with every other detail whether his own creation or not. He knows his work is an exact science. Then why is not his social status inter-dependent with that of every other member?

If any or all of these conditions exist today what is the engineer to do about the matter? Can he solve these problems alone? If he can solve them in his own individual case, has he solved them for posterity? If he cannot solve them alone what is the best method for solving them through the co-operative activity of others in the same work? The wisdom of past experience points out clearly that the engineer cannot solve his problem by the collective bargaining method of the labor union. That plan condemns the super-able man to labor on the plan of the mediocre. Excess of initiative is not welcomed under that plan. The work of the real engineer is a large per cent initiative. Consequently any plan which hampers or stifles initiative must fail and must be rejected in the solution of the engineers' problem.

The economic situation which confronts the engineer is not a new one. It confronted the doctor, the lawyer, the merchant and the manufacturer.

How did they remedy conditions which were uneconomical? Did they combine to restrain trade and control trade or did they, by co-operative effort and educational methods broaden the field and increase the demand for their product? Is there any reason why the engineer cannot apply the same methods to increase the demand for his product and educate the ultimate consumer of that product that he cannot expect to derive the benefits of that product for less than the cost of production? Co-operation between competitors in the manufacturing field has not meant that the individual members of their association could stop securing business for themselves. Neither can co-operation among engineers ever be expected to keep them constantly employed or to eliminate the wise dictate of natural progression, the survival of the fittest.

Why Negotiate?

The Independent Telephone Industry Is on the Advance

BY TERRY W. ALLEN

THE Independent telephone industry is at the present time upon the advance. We have taken the first line of trenches and are ready for another assault. This is evidenced by the fact that the Bell Telephone Company is in a mood again to open up negotiations. This was brought about by the converging of a number of conditions through the various departments at Washington all centering upon the different activities that the A. T. & T. Co. is engaged in. Every one of these lines is drawing closer around the Bell Company and it will not be long, if this course is pursued intelligently, before that company will be glad to compromise its case with Independent telephony and the government; but now is the time aggressively to push these matters. Now is the time to stand for no negotiations of any kind whatsoever, until the position of Independent telephony is definitely and intelligently established.

A number of times the Bell Telephone Company has wriggled out of the hands of the Independent operators who were trying to hold it in check, and then slipped back to its old haunts and its old tactics which is pursued just as vigorously as it had before the very policies that it had agreed to curtail.

The Bell Company is decidedly afraid of the recent investigation that has been started at Washington in regard to government ownership. Not only that, but it appealed to the Independent telephone representative at Washington to help it out of the muddle in which it found itself. To my mind, it is a strange kind of corporation that is so willing to go to the Independent telephone operators and ask them to help it out of difficulties which it has itself created through a lack of foresight in the manipulations of a monopolistic point. The Independent operators have no right to help the Bell Telephone Company out of the muddle into which it has thrust itself through the policy of monopoly. There is no defense to the monopolistic position. It is absolutely indefensible and foreign to the American ideals of democracy and right, and the sooner monopolies learn that they cannot be fostered and upheld in this country, the sooner this country's economic conditions will begin to be founded upon the solid rock of individualism and competition as fair play.

And so the Bell Telephone Company has asked the Independent operators to help it out in Washington. This the Independent operators have refused to do, and rightly and justly so.

I have never been a strong advocate of government ownership, and I am inclined to think that government ownership is just a little too far in advance for our economic conditions at the present time; but I would most readily subscribe to government ownership in preference to Bell domination, if the question was placed upon that ground. I do not think that the Bell Company is an angelic corporation with wings. I think that the abuses it has practiced in the past and the abuses it is practicing at the present time in trying to buy out and destroy the Independent industry are indefensibly wrong. As long as the company is dominated in New York and Boston by a set of directors who are believers in monopoly as a divine right, I would most heartily welcome government ownership in preference. But as I have stated before, and as I state here again, the past acts of the Bell Company and its present indiscretions and violations are bound some day to be brought to trial, and that day is not far off. The country will not stand for monopolistic tactics when the true character of those tactics is known, and therefore the day of reckoning is coming and coming soon.

I was reading an editorial in *Collier's Weekly* this week on the subject of the leak at Washington, and in this editorial was the sentence: "The telephone is always convenient; hence, it is not strange that advance news at the Capitol finds its way swiftly to the brokers' offices." This might be regarded as a reflection against the telephone company's policy in Washington. It was not long ago that the wire tapping scandal was prominent in New York and it is very possible that wire tappers may be at work in Washington. And it is just possible that the use of the telephone in Washington is the cause of all of this trouble.

One of the higher officials of the Bell Company has made the statement in one of the recent Bell telephone magazines that the company's employes are co-operating with the Navy and War Departments in order that in case of war the Bell lines can be turned over to the government. This may be the reason that the Bell officials are so well informed as to what is going on in Washington. You will remember some months ago that with a connection with the Arlington wireless the Bell Telephone Company's representatives talked by wireless to Honolulu, and I suppose that a number of these Bell employes are still working in the War and Navy departments' offices as government employes, in a capacity very much like the National City Bank's representative who used to sit in the Treasury Department, aware of all the conditions that go into the war and navy departments and also into other departments of the government.

This is not an advocacy of government ownership, but it is an advocacy of government supervision over the governmental telephone lines at the Capitol.

I am of the opinion that the Bell Company could furnish some information in regard to this leak investigation, if its officials were called by the investigating committee. Girls on the switchboards in the various departments' offices could possibly give some clues that if followed up would lead to intelligible results. Congress should investigate and investigate quickly, for if this kind of thing is going on, the sooner it is stopped the better.

Improvements at Warsaw

The enterprising Commercial Telephone Company at Warsaw, Ind., of which J. W. Scott is manager, announces the installation of a new 1100 line common battery switchboard at Warsaw, with chief operator's and a wire chief's desk and a two position toll board. All this equipment is going into a brand new building especially designed for it. The company owns its old building which, being in the business district, will become an office building. The company's outside plant is to keep pace with its exchange improvements, and all its telephones will be replaced with new ones.

Court Says Commission Rules

A writ of mandamus sought by Helvig Ellerton to compel the Home Telephone & Telegraph Company of Spokane, Washington, to install a telephone in his home, E3601 Main avenue, under the $2 rate, was denied by Superior Judge Kennan, and a motion to quash by Attorney Frank T. Post for the company was granted.

The court ruled that, since the question was purely one of what a just and fair rate is, the court had no jurisdiction because the question rested solely within the jurisdiction of the state public service commission.

Ellerton contended that the telephone company should be compelled to install telephones under the schedule of the old Home franchise, under which the present company operates. The company, although operating under the old franchise, is charging the rates of the old Pacific Telephone & Telegraph Company, whose local branch was absorbed by the Home company when the people of the city failed to ratify a new franchise for the Pacific company.

In rendering the decision the court said:

"Prior to the passage of the public service commission law, I concede that the city had a right to specify rates in a contract between the city and the company. Since the passage of the new public service commission law, in my opinion, the commission has assumed full jurisdiction in the matter of determining just rates.

"The superior and supreme courts have no right to take a hand until that commission has passed on the rates. There is nothing here to show that it has yet passed on these rates.

"This, in my opinion, is not a question of what the rates of the franchise or the city ordinance call for, but what is a reasonable rate. That is a matter this court can not pass upon. The city might make an order compelling the company to furnish service at the rate asked and the commission might change it tomorrow, and this court would be powerless to act."

The petitioner for the writ was represented in the case by Corporation Counsel J. M. Geraghty and his assistant, Alex M. Winston.

Mr. Winston, who handled the case, urged upon the court that the telephone company had agreed to furnish a $2 telephone, and it was largely because of the promises of the Home company franchise that it was approved by the people of the city, and it was largely because of the increased rate of the old Pacific company franchise that its renewal was rejected by the people. The company, he said, had promised one thing and then had broken its promise.

Attorney Post contended throughout his arguments that the superior court had no jurisdiction in the matter as it was clearly up to the state public service commission.

Mr. Geraghty said he planned to take an immediate appeal of the case to the state supreme court.

Book Says Government Ownership Fails

Government ownership of public utilities has been proved a failure in the Province of Manitoba, according to facts disclosed by James Mayor, professor of political economy in the University of Toronto, in a book just published by Moffat, Yard & Company, New York. It deals with the operation of the telephone system in Manitoba. Prof. Mayor claims that the venture has been a losing one since it was started in 1908, the aggregate losses for seven years, ending with 1914-15 being approximately $1,000,000. The government at first made a claim that the telephone system was yielding a yearly profit, but, in doing so it made no allowance for interest, depreciation and maintenance, Prof. Mayor claims. The most unfavorable aspect of the experiment, he says, was the fact that, from the beginning, the system was used for political purposes, sometimes overtly, at other times furtively; but always, he claims, "with a cynical disregard of the system was always subordinated to the political management; even rates were determined, not by the commissioners appointed by the government, but by the government itself; and in fixing these rates, the government sharply discriminated against the urban areas. This was done for the purpose of getting votes."

Kinloch Stockholders Meet

Stockholders of the Kinloch, Missouri, Telephone Company met in annual session recently and elected directors. Only one change was announced in the board, John B. Kennard being elected to succeed his father, S. Kennard, deceased. Other directors elected are: H. Linton Reber, Henry Nicolaus, William R. Orthwein, William H. Bassett, Murray Carleton, Edward A. Faust, Breckinridge Jones, William J. Lemp, William H. Nolker, Fred C. Orthwein, Julius S. Walsh and Rolla Wells.

Ohio State Financing

The exchange of 5 per cent bonds of the companies which consolidated into the Ohio State Telephone Company was authorized by directors of the company at a meeting in Columbus, dispatches state. The bonds will be exchanged for $5,032,000 maturing bonds of the three subsidiary companies as authorized by the consolidation approved by the state utilities commission in 1914.

The new issue of $5,000,000 will pay 4 per cent until July 1, and thereafter will pay 5 per cent, it is stated. It is stated the basis of exchange is to be at the rate of 90 for the new Ohio State bonds and 100 for the old bonds of the subsidiary companies.

Closing Daytona Merger

J. M. B. Hoxsey, second vice-president of the Southern Bell Telephone Company, accompanied by District Manager Boyd and Engineer O. C. Rauschenberg, were in Daytona, Florida, in connection with the contemplated purchase of the local system by that company.

The engineer of the company was present with a view to planning immediate improvements as soon as the system is taken over by the Bell Company. The cable now laid under Beach street will be abandoned and replaced by a cable of modern design.

Mr. Hoxsey stated that it would probably be the middle of March before everything would be in readiness for the Bell company to take over the system.

More Decorative Effects

A plain cardboard telephone directory will not do at all for the handsomely furnished boudoir or library; even a morocco leather bound directory is no longer quite good enough. Like everything else, these days, the telephone appurtenances must be elegant and luxurious. This directory to hang on the wall near the telephone is made of rich blue tapestry brocade and dull gold braid. A small French print is inserted in the center, under a frame of narrow gold galloon. The handles are of gold cord and blue chenille and the pages of the directory with their projecting tabs holding the letters of the alphabet are of heavy, cream tinted cardboard.

Public Utility Commission News

Reports Concerning the Activities of State Regulating Bodies in the Telephone Field

California

The Railroad Commission has issued an order authorizing the Pacific Telephone and Telegraph Company to acquire the entire issued capital stock of the Riverside Home Telephone and Telegraph Company. This is a step in the purchase of the system of the Riverside Home Telephone and Telegraph Company by the Pacific company. The Pacific company has bought all the bonds of the Riverside company to the value of $275,000, and paid for them $168,254.44. The permission given by the Railroad Commission is a legalization of this transfer of securities. The Pacific company proposes to dissolve the Riverside company and charge against its surplus the amount paid for the capital stock of the Riverside company, $95,542.25.

The Railroad Commission has issued an order authorizing the Sunset Telephone and Telegraph Company to sell to the Pacific Telephone and Telegraph Company for $10 its entire telephone plant in California, including all real estate and other property. The Sunset company owns a general telephone and telegraph system throughout the state, and its property has been leased to the Pacific company since 1907, and operated by the latter company. All its capital stock of $15,000, is owned by the Pacific company, and the Sunset company has no indebtedness except to the Pacific company. The authority given by the Railroad Commission is a formal legalization.

The Railroad Commission has issued an order declaring that public convenience and necessity require the exercise by the Pacific Telephone and Telegraph Company of the rights conferred upon it by a franchise granted by the city of Vallejo last June. The Pacific company has filed with the commission a stipulation that it will never claim any value for this franchise in excess of the amount paid for it, and the commission's authority is a formal confirmation of the franchise.

The Railroad Commission has issued an order authorizing the Pacific Telephone and Telegraph Company to operate under a franchise granted by the city of Richmond. A stipulation is filed with the commission as in the case of the franchise granted by Vallejo.

Colorado

The commission, after eighteen months of investigation, finds that the fair value of the company's system in this state, for rate-making purposes, is $14,698,414, or $6,059,386 less than the valuation which the company's experts tried to establish. On the basis of valuation the commission finds that the company is not earning in full a reasonable rate of return, fixed at 8 per cent, but on the other hand states that the concern will not be permitted to increase its rates to bring the full return.

Upon the valuation fixed by the commission, the company would have been entitled to earn $3,883,191.79 in 1915 to meet all reasonable operating expenses, depreciation reserve requirements and 8 per cent return upon its investment. It fell short of this figure by $484,921.37. The commission holds that since it is earning practically the full return to which it is entitled, that no increase in rates could be allowed.

With a fair valuation for rate-making purposes established, the commission is now ready to hear testimony and evidence from the public relative to the reasonableness or unreasonableness of existing rates and the adequacy of service. Hearings for this purpose will be set in a short time and all individuals and communities which have grievances against the company will be requested to appear at these hearings.

To insure fair treatment of the public and the company, an inventory and appraisal of the company's property in the state was made.

The items in the total valuation by the commission are as follows:

Cost of reproduction, less depreciation	$12,350,468
Reasonable cost of organization	358,024
Cost of acquiring franchises	15,000
Surplus assignable to Colorado	225,000
Unearned accrued depreciation	1,364,922
Total	$14,312,414

A table included in the opinion shows the revenues and operating expenses of the company for four years to be as follows:

	Revenues.	Expenses.
1912	$3,412,564.50	$1,890,159.30
1913	3,509,966.92	1,993,547.50
1914	3,332,736.59	2,074,440.58
1915	3,398,270.42	1,998,823.88

The decision concludes with the statement that evidence shows the company to have been alive to the needs of the public, that its service has been adequate and that the management of its finances and business have been efficient, economical and honest.

Illinois

An agreement was reached January 19 whereby the Macomb Telephone Company secures control of the Western Telephone Company and will merge the two plants. This is subject, however, to the approval of the state utilities commission, but there is little likelihood that there will be any objection. The Macomb Telephone Company will, when the merger is sanctioned, dismantle the plant of the Western Telephone Company.

The public utilities commission a year ago made a request of the state civil service board that the following heads of departments under the commission be exempted from civil service: Gas engineer, railroad engineer, service engineer, electrical engineer, telephone engineer, mechanical engineer, chief of the accident division and transportation rate expert. The commission after a number of hearings has refused to exempt the heads of departments named and has ordered Secretary Ward Robinson to proceed to hold an examination to fill the places.

An examination will be held March 3 for chief of the accident division and on April 7 for service engineer and gas engineer and telephone engineer. Examinations held in the last three years are canceled, as a number of new questions have come up for the applicants to answer.

Iowa

The Iowa State Railroad Commission has affirmed the right of both telephone and telegraph companies furnishing electric current of high voltage to use the public highways of the state.

In a case brought against the Sumner Light & Power Company by the Hawkeye Co-operative Telephone Company charging interference from paralleling the telephone line the Railroad Commission held that while there is such an interference it does not justify the abandonment of the transmission line.

The power company received its franchise to use certain highways only after it had agreed with the telephone company to build the lines the same as those between Cresco and Decorah.

On the hearing of the matter, the telephone company which operates a grounded system, contended that the power company "failed in its agreement in that it did not build a three-phase line, did not transpose it, and did not put on a static wire; did not so construct its line as to overcome 'loss of electricity and induction'; did not use the most modern appliances for overcoming induction, and did not use any of the methods now in use for preventing induction, and failed to construct its line in the same manner in which the Cresco-Decorah line was built."

"The relief asked by the telephone company partakes very largely of the nature of an application for an injunction. We think a court would not be justified in granting an injunction upon a petition containing such allegations, and supported only by the proofs offered in this case, and in that respect the powers of this commission are no greater than the powers of a court. It being possible, at small cost, to so modify or change the system of the telephone line that both it and the transmission line could use the same highway, without substantial interference with or destruction of the property of either, the transmission line should not be denied the right to the use of the highway. If the telephone company is entitled to recover damages for any interference caused by the transmission line, and for the cost of so changing its plant as to avoid interference caused by the transmission line, such relief cannot be granted by this body, but must be found in the courts.

"We have reached the conclusion that the insulation of the transmission line would be improved if it would use insulators of a higher voltage rating, and we, therefore, order that the Sumner Light & Power Company insulate its line with insulators of a higher voltage rating than is now being used by it.

"We recommend to the Hawkeye Co-operative Telephone Company that it improve its line by placing glass insulators where its wires are now resting on wood between the brackets and poles, and we would suggest that insulating bushing be used where the wires pass through the walls of the houses, and that the trees along its line should be properly trimmed, so as not to interfere with the line."

Massachusetts

Vice-president E. K. Hall of the New England Telephone and Telegraph Company joined with Chairman Macleod of the Public Service Commission, January 22, in urging the ways and means committee to provide $25,000 for an investigation of the telephone business by the commission.

Mr. Hall explained that the company had for some years been convinced that its own interests, and that of the public required some action which would result in the facts relating to the telephone industry being at the disposal of the commission.

"The policy of supervision," he said, "is a fact and must be accepted as such. That being so, exact information by the commission is essential. We have objected in the past to an investigation resulting through a bill filed in the Legislature, but never have had objection to one instituted by the Public Service Commission, as a result of a request in its annual report.

Chairman Macleod of the Public Service Commission said that while his board is charged with supervision of telephone companies, it has not the information upon which to act intelligently.

Asked why $25,000 is necessary for the investigation, Chairman Macleod said it is proposed to make the inquiry very thorough into the fundamentals of the business, including the finances of the company, its capitalization, its methods of doing business and its rates, as well as its relations with other companies—the Western Electric, for example, he concluded.

Mr. Macleod said there is a suspicion that the toll service is not bearing its proper proportion of the telephone burden.

Representative J. Weston Allen of Newton, Massachusetts, has filed a bill in the Massachusetts House calling for the reorganization of the Public Service Commission and the Gas and Electric Light Commission. The new plan contemplates a board of seven members, to be appointed for terms of seven years, the salaries to be $7,500 each, with the exception of the chairman, who is to receive $8,000. It is contended by Representative Allen that a saving of about $30,000 a year to the state would result from the merger. According to the bill, four subboards of three members each are to be appointed by the chairman to deal respectively with steam railroads and steamships, electric railways, gas and electric lighting companies and telephone and telegraph service. It is proposed that each of the six members, who with the chairman constitute the board, will serve on two of the sub-boards. The chairman and secretary of the commission are to be appointed by the governor, and the chairman will have power to appoint the sub-boards and the chairman and secretary of each. A clause in the bill declares that the decision of the sub-board shall be the decision of the commission. A vigorous contest over the bill is anticipated in the present session between interests favoring conservative and radical regulative practice.

Minnesota

In the matter of the petition of J. C. Johnson, H. E. Alstead, Chris Nelson, M. O. Dahl, and thirty-one others for telephone service in the depot of the Great Northern Railway Company at Evansville, Minnesota and;

In the matter of the petition of E. H. Hawland, A. T. Larson, O. J. Bjornstad, E. Negaard, and thirty-three others, for telephone service in the depot of the Great Northern Railway Company at Neilsville;

Mr. Howatt, supervisor of telephones writes:

"I am directed to advise you that in answer to the petitions in the above matters the Great Northern Railway Company has advised the Commission that they will order a telephone installed in its depots at Neilsville and Evansville at once.

"This action on the part of the railway company satisfies the complaint and further proceedings are therefore dismissed."

In the matter of the petition of Andrew B. Lee, O. Manseth, A. A. Forsberg, Oscar Rosby, and thirty-six others, for telephone service in the depot of the

Minneapolis, St. Paul & Sault Ste. Marie Railway Company at Farwell, Minnesota, and;

In the matter of the petition of H. Hendrickson, J. H. Milne, Vicar H. Kron, G. McMurtrie, and eighteen others, for telephone service in the depot of the Minneapolis, St. Paul & Sault Ste. Marie Railway Company at Hoffman; and

In the matter of the petition of the Kensington Mercantile Company, J. P. Gran, P. Schapiro, C. O. Colmack, and thirty-four others, for telephone service in the depot of the Minneapolis, St. Paul & Sault Ste. Marie Railway Company at Kensington, Minnesota;

Mr. J. W. Howatt, supervisor of telephones, writes:

"I am directed to advise you that in answer to the petition in the above matters that the Minneapolis, St. Paul & Sault Ste. Marie Railway Company has advised the Commission that they will order a telephone installed in its depots at Farwell, Hoffman and Kensington.

"This action on the part of the railway company satisfies the complaints and further proceedings are therefore dismissed."

The Commission has received the application of F. E. Garner, secretary of the Le Roy Telephone Company, Le Roy, Minnesota, for authority to place in effect the following regulation:

"That after January 1, 1917, the Le Roy Telephone Company require a deposit of Five ($5.00) Dollars from each new subscriber. Said deposit, less such amount as may be due the company for telephone rental and tolls to be returned to the subscriber on the expiration of the contract (verbal or written) between the parties. A certificate of deposit shall be issued to each new subscriber paying five dollars. The certificate shall be non-transferable, and shall bear interest at the rate of five per centum per annum, payable on the first day of July of each year."

The following form of certificate of deposit accompanied the application.

"This certifies that ..... has deposited with the Le Roy Telephone Company, Five ($5.00) Dollars, as a guarantee for the payment of all bills for telephone service and tolls. This deposit less such amount as a subscriber may owe to be refunded upon expiration of contract between parties heretofore and hereon.

"We promise to pay interest thereon at the rate of five per centum per annum, payable July 1st each year upon the surrender of the coupon attached hereto.

"Not transferable. Date issued .....

"Le Roy Telephone Co.,

....., Secretary."

Attached to the certificate of deposit are nine annual interest coupons.

J. W. Howatt, supervisor of telephones, is directed to advise the Le Roy Telephone Company that the proposed rule would impose a burden upon many subscribers and could only be justified by a showing that it is necessary in order to protect the revenues and property of the company.

The company's service is furnished upon the unlimited or flat rate basis, and you can protect yourself by collecting in advance for this service or by discontinuing service upon a refusal of patrons to pay charges in advance or for services rendered.

The application is denied. This ruling is supported by decisions made by the utility commissions of the States of Illinois, Washington and California.

The deposit is justified by many of the authorities where utilities furnish service on a measured basis, since in that case the amount of the charge cannot be determined until the service has actually been rendered.

The application of the Commercial Telephone Company to increase its local exchange rates in the village of Belgrade, Minnesota, to increase the rural line switching rate and to establish a toll rate between the villages of Belgrade and Brooten, Minnesota, was heard at Belgrade by J. W. Howatt, supervisor of telephones. A. M. Madson, manager, and H. Borgerding, secretary of the Commercial Telephone Company, and fourteen others, representing rural line companies, were present. The evidence and reports in the case have been duly examined by the Commission and it finds the following facts:

The company operates an exchange at Belgrade and connects with several rural lines. It gives service from 7:00 A. M. to 9:00 P. M., Sundays and holidays excepted, and it wants to give 24-hour service for each day of the year. The extra service will cost more money in wages, heat and light, and that is one of the reasons for the application to increase the individual line business rate from $1.50 to $2.00 per month, individual line residence rate from 75 cents to $1.00 per month, and rural switching fee from 10 cents to 25 cents per month. There are in service thirty (30) business, forty-five (45) residence and two hundred thirty-nine (239) farm stations, some of the latter receiving indirect service over lines connected with the exchange. Several rural lines connect with the exchange and there is no uniformity in the switching charge, it varying from 5 cents per message to 10 cents and 15 cents per month per telephone for different lines. The applicant is willing to charge a flat switching rate of 25 cents per month per telephone, or a measured service rate of 5 cents per message. The farm subscribers object to an increase, but no local subscribers protested. No conclusive testimony was offered to show the cost of switching service, but the company does receive 5 cents on each "in" and "out" toll message. The physical property has been valued by our Engineering Department and it places the reproduction cost new at $4,680.07, and the present value at $2,895.57. The company is capitalized at $4,100.00. It was organized primarily for the convenience of the village and rural communities in order to bring business into the village. On January 1, 1916, the company leased the property to its present manager, A. M. Madson, for a 6 per cent return upon the value and a 6 per cent charge to depreciation, a total of 12 per cent upon the value. It has been difficult to ascertain the exact operating revenues and expenses for a period of years, due to imperfect bookkeeping, but from the best evidence obtainable, it is found that the net operating income shows in 1912 a return of $277.77; in 1913 a loss of $75.01; in 1914, a return of $40.19, and in 1915, a return of $488.60. Nothing was charged to depreciation and the manager charged only $8.00 per month for keeping the books.

The last two years the operator's wages amounted to $430.00 per year, or $35.83 per month, and maintenance was light. Since the change the first of the year the company has paid the operators $50.00 per month, and the manager has collected $40.00 per month, and out of this sum he pays the labor used in maintenance work. He has agreed to pay the operators $65.00 per month if the 24-hour service is installed. The proposed increase would add $315.50 to the exchange revenue and about $185.00 to the switching revenue, this being upon the assumption that 150 rural stations which call Belgrade direct would be affected by the flat 25 cents increase.

The estimated revenue from tolls is $300.00. This allows an estimated revenue for 1917 of $2,010.00, against which there will be an expense charge, including taxes, and a 6 per cent depreciation or approximately $1,712.07, leaving a net balance of $299.93, which is 10.3 per cent upon the present value. Out of this surplus the lessee must pay 6 per cent upon the value to the owner and hence it is apparent that the present management, even under

most fortunate operation, has little to look for outside of his salary.

In the absence of accurate data showing the cost of switching service, the Commission is not warranted in granting an increase to 25 cents per month for all rural lines and stations. This service is valuable to the rural subscriber and he should at least be willing to pay something for it.

Upon the evidence in the case, the Commission is willing, however, to give each rural line the option of accepting switching service at a flat rate of 25 cents per month for each station, or a charge of 5 cents per message, subject to the maximum charge of 35 cents per month for any station. The Commission fixes a maximum charge of 35 cents per month for service under the message rate because of the additional cost of checking, recording and billing the messages. The rural company must decide which service it wants and notify the Commercial Telephone Company of its decision previous to the effective date of this order. It is not a legal discrimination for an exchange to charge a flat switching rate to one rural company and a message rate to another. The latter service is more expensive, because the messages will have to be recorded and itemized bills made. To reduce operating cost and the inconvenience incident to the collection of small accounts it would be desirable to have a uniform practice at each exchange. From an examination of the evidence, the Commission grants the application for an increase, subject to the option just stated.

It is therefore ordered, that the Commercial Telephone Company, be, and the same is hereby permitted to charge $2.00 per month for individual line business service, and $1.00 per month for individual line residence service, and a switching charge for rural line service of either 25 cents per month per station, or 5 cents per message, subject to a maximum of 35 cents per month for each station.

This order shall become effective February 1, 1917.

Missouri

The Public Service Commission of Missouri approved the consolidation of the Missouri and Kansas Telephone Company and the Southwestern Telegraph Company, under the name of the Southwestern Bell Telephone Company on January 9, 1917.

The commission at the same time approved the increase of the capitalization from $20,000,000 to $50,000,000, and the absorption of the Pioneer Telephone Company and its property in Oklahoma, and the acquisition of an important system in Arkansas.

The consolidated company paid a fee of $15,000 to Secretary of State Sullivan on the increase of capital.

Nebraska

Olson Brothers, garage keepers of Ithaca, Nebraska, who objected to the railway commission that their competitor was the manager of the Lincoln Telephone and Telegraph Company's exchange, which they said gave him an unfair advantage in corralling business, have dismissed their complaint.

The railway commission has declined to allow the Gothenburg Telephone Company to increase from $1 to $1.50, the rate on residence desk phones. The commission holds that an extra 25 cents a month is all the desk phones are worth.

In spite of the fact that 1,044 of the 1,276 subscribers of the Kearney Telephone Company petitioned for a rate raise to $3.50 on single line business telephones, and $3 on two-party telephones of the same class, the state railway commission has denied the application and voluntarily fixed the rate at 50 cents below that figure in each case. The commission, however, grants increases on single party residence telephones and two and four-party telephones of this same class, likewise farm telephones.

South Carolina

A recent order issued by the South Carolina railroad commission requires all of the telephone and telegraph companies operating in South Carolina to remove from the public highways all of their poles, wires and props for poles and wires, in order to free the public highways from obstructions and make the highways safer for travel. One year is given by the commission for the telegraph and telephone companies to make the removals.

This order was decided upon at a meeting of the Railroad Commission upon January 3 and has been promulgated among the telephone and telegraph companies of the State. In putting it into effect, it will mean the expenditure of large sums of money by the companies in removing the poles and wires and securing rights of way for their lines.

Washington

Cosmopolis will be placed in the same position as Aberdeen with respect to telephone service. The public service commission has decided that the town was entitled to be placed on a par with Aberdeen. The telephone company will expend $14,000 in improvements.

West Virginia

Two public service utilities of West Virginia were permitted by the Public Service Commission to advance their rates on January 4, 1917. They are the Hundred Telephone Exchange Company, operating in Wetzel county and the West Virginia Telephone company of Elkins.

The Hundred corporation is allowed to advance its rates for business house telephones from eighteen dollars a year to twenty dollars. The Elkins concern is permitted to make slight increases generally throughout its schedules.

A petition was received by the commission from the Green Sulphur Springs Mutual Telephone Company asking for permission to advance its rates from thirty and thirty-five cents a month to forty cents a month for all subscribers on the line. The company operates in the counties of Summers and Greenbrier.

Wisconsin

The Peoples Telephone Company of Wayne, Wisconsin, has announced that hereafter rates on party lines with four or more subscribers will be $1.25 a month, a raise of 25 cents over the former rates. Increase in cost of materials and labor is given as the reason for the raise. The State Railroad Commission has also given the company the right to make the increased charge.

Cover telephone poles with woodbine. This hint in outdoor decoration was given members of the Minnesota Garden Flower Society at university farm by Mrs. E. W. Gould, Minneapolis.

Of Interest to the Trade

What the Telephone and Accessory Manufacturers Are Doing to Advance the Art

An Efficient Pole Changer

The Stromberg-Carlson pole changer provides a simple, efficient and self-contained ringing equipment for exchanges serving 500 subscribers or less. It consists of an electrically driven vibrator which carries the contact springs arranged to reverse a 24-volt direct current from 16 to 20 times per second, thus giving a 24-volt alternating current at a frequency of 16 to 20 cycles, depending upon the adjustments. The alternating current obtained in this manner is put through a transformer which is also included in the equipment and stepped up to approximately 90 volts. This completes the transformer and the current is delivered to the ringing current terminals of the pole changer at the proper voltage and frequency. The primary current for the operation of the pole changer can be supplied by a battery of 36 dry cells or 11 storage cells.

The battery is also used for operating the vibrating element.

The complete equipment is contained within a well-built oak cabinet which occupies a space 12 by 12 inches and stands 14½ inches high. It is provided with a hinged cover and a dust-proof glass top compartment for vibrator as shown in the accompanying illustrations. The operation of the vibrator can be readily observed without opening the cabinet. The vibrators and transformers used in pole changers of this type are the same as those used in the Stromberg-Carlson harmonic converters in which the ringing current voltages and frequencies must be very accurately defined, therefore the same degree of constant high efficiency may be expected from the equipment. All parts of the vibrator are mounted on a heavy slate base which maintains a high

The Stromberg-Carlson Pole Changer with its Dust Proof Glass Cover Closed.

insulation between parts having different potentials and also prevents loss of adjustment due to moisture and changes in temperature.

When operated from dry cells, special contacts and a starting relay are included in the equipment. These conserve the energy of the dry cells as the vibrator operates only during the ringing period, or in other words when the operator is actually holding a ringing key in its ringing position.

The standard ringing frequency, as stated in a preceding paragraph is 20 cycles per second, but pole changers designed to deliver ringing currents at other frequencies can be furnished to order. Further information regarding this ringing equipment can be obtained from any Stromberg-Carlson salesman or business office.

The Stromberg-Carlson Pole Changer with its Cover Raised for Inspection of its Working Parts.

Bureau of Standards on Cartridge Fuses

There is a new publication of the Bureau of Standards (Technologic Paper No. 74) entitled "Investigation of Cartridge-Inclosed Fuses."

The bureau's investigation shows that the Economy fuse, when new and properly filled or refilled, operates satisfactorily under the most common working conditions of overload and moderate short circuits when in circuits with low inductance, and possesses some marked advantages over the approved fuses with which it has been compared.

The bureau's finding recommends that Economy fuses be not approved at present for general use on the same basis as fuses at present listed as standard by Underwriters' Laboratories (Inc.), but that their use be permitted by municipal and underwriters' inspection departments under conditions where their performance can be observed by each inspection department until sufficient experience regarding their performance under service conditions can be obtained to justify an unqualified approval or refusal to approve.

This paper is now available for distribution and those interested may obtain a copy by addressing a request to the Bureau of Standards.

Banquet in Honor of the Automatic Electric Company's Twenty-fifth Anniversary, Louis XIV Room of Hotel La Salle, Chicago, January 27, 1917.

Automatic's Silver Anniversary

Twenty-five years of progress were celebrated by the officials and employes of the Automatic Electric Company at the Hotel La Salle's Louis XIV room on Saturday evening, January 27, with a silver anniversary banquet and dance.

Announcement was made during the post-prandial period that Joseph Harris, president of Automatic Electric, had opened a savings account with a leading Chicago bank for each of the employes present, and when the deposit books were passed around the banqueters found that the amounts paid for the banquet had been entered to their credit through the generosity of the president and the company.

As is customary at these annual banquets of the Automatic Electric, prizes for helpful suggestions were given out. The list of winners this year was long, and many diamond-set rings, gold rings, gold fountain pens, gold pocket knives, and watch fobs were given out as tributes to the usefulness and co-operation of the employes whose suggestions during the year had been tried out and adopted as good practice.

The banquet, which was ready at 7 o'clock, was a feast in itself, and was made the more enjoyable by the spirited singing of songs by the hundreds of Automatic Electric "boys and girls," and by the Automatic sextet, to say nothing of the orchestra which was on duty during the time when the diners were busy with what was set before them. The speech-making and presenting of prizes was over at 10 o'clock, and then the banquet hall was cleared, and dancing was indulged until midnight.

President Harris, who, much to his regret, was detained by business in New York, sent the following telegram which his son, Vice-President H. A. Harris, read to the gathering:

On this twenty-fifth anniversary of the formation of the first company to manufacture Automatic equipment, I congratulate you on the fact that after all these years of struggle our product is recognized and firmly established in this country and throughout the civilized world. Automatic telephony is here and Automatic Electric brought it here. I thank you for your loyal support, and I know that each feels that he is a part of the organized whole. I regret exceedingly my enforced absence from this banquet. These banquets have always been a source of much pleasure to me.

One of the vice-presidents, J. B. Russell, also sent a telegram of congratulation from New York.

H. D. Critchfield, toastmaster, and the following speakers—Vice-Presidents H. A. Harris and Grant Pelton, together with R. R. Stevens, commercial superintendent of the Ohio State Telephone Company, and Elmer E. Daicey, president of the South Bend Home Telephone Company—all paid tribute to that splendid spirit of co-operation which distinguishes Automatic Electric employes and which, really, underlies the whole remarkable organization and production of the plant. General Superintendent W. Lee Campbell read the winners.

Mr. Critchfield expressed one sentiment of the "family" gathered for the celebration, when he said:

"I do not say that the automatic telephone is perfect—nothing is perfect that is worth while. But criticisms that the sales force once had to meet—that the automatic telephone *looked* crude—no longer have to be met, thanks to the splendid co-operation all along the line. We cannot let down, however. The company that has led in telephone development is the Automatic Electric, and we have got to stay in front. It's up to us to keep the lead."

Mr. Stevens, the principal after-dinner speaker, paid tribute to two men who have done great service in auto-

matic telephony—Joseph Harris, "the man of vision," and A. E. Keith, "the man of imagination." He explained to the people who actually make the automatic apparatus, just how much of a part they are playing in the improvement of living conditions throughout the civilized world. "You are also helping to make the world 'cuss-less'," he said, amid general laughter. In speaking of conditions in Ohio—"the Automatic State"—Mr. Stevens said the people who use the automatic for local service are already urging and planning for the time when automatic long distance service shall be universal, regulated without the intervention and delay of an operator, through the instrumentality of an automatic measuring and timing meter. "The automatic," said he, "is not only the best telephone made, but it is the best to sell."

Kellogg at State Conventions

The Kellogg exhibit at the Ryan Hotel, St. Paul, last week, at the Minnesota State Association annual convention, was crowded during the three days.

In addition to the Kellogg low keyshelf standard magneto switchboard, P. B. X. and universal equipment there were exhibited the illuminated display panels showing the complete Kellogg apparatus line, and also the magneto telephone panel as demonstrated at the Chicago convention. This latter panel contains all the Kellogg standard magneto wall subscriber sets and gives prospective buyers an excellent opportunity for comparison.

A. J. Carter, sales manager, E. G. Lawrence, state representative, and F. L. Eldridge welcomed the many friends of Kellogg in Mnnesota.

The Nebraska convention was marked with the same degree of enthusiasm as was manifested at the Kansas meeting, although it did not quite equal Kansas in attendance.

The principal business transacted at the Nebraska convention by the exhibitors was the closing of a contract for a new Kellogg common battery equipment for the Wisner, Nebraska, exchange of the Cuming County Telephone Company.

The flexibility of this Kellogg magneto switchboard equipment and the ease of assembling apparatus therein, to order, is shown by the fact that on December 28 the shop received an order from the Missouri and Kansas Telephone Company for one of these cabinets to be arranged ready for calculagraph and fitted with line circuits, multiple jacks, guard lamps and designation strips for use as a two position multiple toll board for the El Dorado, Kansas, oil boom, and was able to make complete shipment of this extremely special equipment on January 12, 1917, or in two weeks after the order reached the shop.

A 100 line, low keyshelf board, also shown, was sold to the Denton (Kansas) Telephone Company.

The new line of grabaphones for magneto and common battery work excited much favorable interest and large numbers of initial orders were taken from companies who had either never used any equipment of this kind heretofore or had used and discontinued because of excessive maintenance the older microphone equipment which the new grabaphone sets have been designed to replace.

In the new equipment practically unbreakable Kellogg Bakelite replaces the former brittle hard rubber for handles, mouthpieces and receiver shells. The handle is octagonal and split in halves and the loosening of two machine screws removes one-half of the handle exposing the cord connections without interfering with either the assembly or operation of the set.

The standard line of Kellogg telephones was exhibited on a rack ingeniously constructed of cross arms and cross-arm braces as a reminder that the Kellogg Company handles high-class construction materials as well as telephones and switchboards.

Of course, there was the Kellogg demonstration universal switchboard, preaching the gospel of the wisdom of installing common battery without the usual difficulties incident to the compulsory acceptance of a new service at higher rates.

At the Kansas convention held at Topeka in December, the Kellogg Company occupied its usual quarters, consisting of two large exhibit rooms at the National hotel.

The idea of two rooms is to separate the magneto and common battery exhibits so that each manager can confine his inspection to the equipment in which he is most interested. Besides, one room, no matter how large, is no longer adequate to care for the crowd always to be found in Kellogg exhibits at the conventions.

The equipment featured in the Kansas exhibit this year consisted of a 320 line, two position, low keyshelf magneto switchboard of the type recently installed at Ness City, Tipton, Holyrood, El Dorado, and several other Kansas exchanges.

A Modern Sand Storm

Herodotus tells us of an ancient army sent out by Cambyses against a people called the Ammonians, which never returned and whose fate was, to their countrymen, never known.

Those against whom they marched, however, related that when about half their journey, which was across the Sahara sands, had been completed, and while eating their dinner, a great sand storm overtook them and completely covered them.

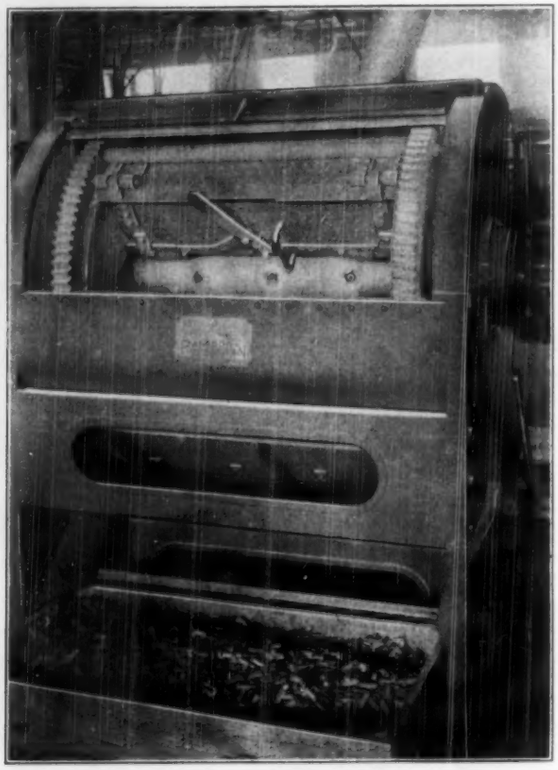
A Seventy-five Pound Jet of Sand.

The accompanying illustrations show a couple of more modern sand storms which make up in intensity what they lack in volume when compared to the one just quoted.

In the smaller cut, the downward pointed nozzle delivers a jet of sand driven out by air at a pressure of seventy-five pounds.

In operation the interior of the box is lighted, the operator inserts his hands and arms, heavily gloved and protected, through the two oval holes.

The nozzle is raised (it has been lowered so as to be seen) and the jet is turned on. Parts of telephone apparatus such as desk stands, etc., which are to receive the famous Kellogg everlasting black enamel are held and turned beneath this furious, biting, cutting gale. The operator is enabled to watch the progress of the cleansing through a glass protected opening somewhat higher up which the cut does not show. But a few moments suffice to cut and clean the surface of the article to perfection. The minute gashes cut by



The "Sandstorm" Tumbler for Small Parts.

the grains of sand, form little hand holds for the enamel and that's why it doesn't come off.

The machine shown in the larger cut handles the very small parts which could not, with economy, be done by hand. Two bushels in twenty minutes is its capacity.

The huge drum revolves, and by means of a hollow shaft, four jets of sand are directed downward into the rolling, tumbling mass. Small parts get between larger ones and throughout each crevice and corner, strikes this relentless storm of sand, paving the way for the future coat of that pleasing dead black enamel which makes Kellogg equipment a thing of beauty and a joy forever.

De Forest Wireless Telephone

The De Forest wireless telephone played quite a part in the transmission of news during the recent Presidential election, messages being transmitted over a distance of 200 miles. The life of the oscillion bulb, when properly used, is stated to be 300 to 500 operating hours, equivalent to about a year's service.

The ¼-K. W. Oscillion telephone and telegraph transmitter for aeroplanes is a combination telephone and telegraph transmitter using undamped waves, and is stated to be the only telephone transmitter constructed for aeroplanes. The use of the direct-current generator and undamped wave telegraph transmitter offers many advantages over any type of quench spark alternating-current transmitter.

In the first place there is no spark frequency, and no critical alternator frequency, calling for careful speed regulation. The generator is direct driven by an aerofan, or if preferred can be belt-driven from the aeroplane engine shaft. The speed of the generator can be anything within reasonable limits, as an automatic voltage regulator takes care of the voltage regardless of speed. The makers state that the use of the undamped wave transmitter greatly diminishes insulation troubles in the aeroplane, and permits of greater secrecy in signalling, a very important feature in military use. Moreover, the undamped wave transmitter with the ultraudion receiver gives a clear musical note at the receiver, the pitch of which can be adjusted by the receiving operator.

The power plant consists of a special stream line generator enclosed in an aluminium shell, direct-driven by a two-bladed wooden propeller, 18 inches in length. In the fore part of the frame is a double commutator generator, generating 1,500 volts at 4,500 revs. per min. Behind this on same shaft is a 35-volt 75-watt generator for the lighting filament. A cable containing six conductors for current supply and field controls, leads from the tail of the generator frame to the voltage control box where a special vibrating contact operated by a solenoid in series with the B circuit controls the B field by cutting in and out a resistance. By this arrangement the B voltage remains sufficiently constant under great variations of speed.

The generator is intended to be mounted on the upper plane of the aeroplane directly above the fusilage. The control box is located within the fusilage, as is also the brake lever. This latter, by means of a Bowden wire, applies an asbestos-covered friction brake to the propeller. This brake is to be used when the aeroplane is going at very high speed, as when diving, etc. It is advisable, moreover, to bring the generator to a standstill by means of this brake whenever the wireless appartus is not being used.

The transmitter panel carries three indicating instruments indicating the filament amperes, the flux milliamperes and the radiation amperes. The 6 in. bulb is very flexibly mounted on spiral spring supports. On the back of the panel are mounted a litzendraht wire helix having six contact points, permitting various changes of wave lengths.

The filament ampere meter gives the operator all necessary information as to speed and voltage of generator, and he controls same if necessary by means of the friction brake above described.

There is provided a double antenna reel with 250 ft. of special antenna wire on each. This wire breaks at 30 lb. pull, so that if it catches it can cause no danger to the aeroplane. Tests have shown that a larger capacity than that furnished by a single antenna wire is of great advantage.

The generator weighs 40 lb., the panel and bulb 27 lb., and the total weight is 81 lb.

With two antenna wires 250 ft. long extending from the wing tips or extremities of the fusilage of an aeroplane, and when using a suitable counterpoise of copper or bronze, entirely independent of the bad damping effect of the steel guides of an aeroplane, the range of this ¼-kw. telegraph set is stated to be 100 miles. The telephone range is 20 to 35 miles.

Congress Receives Lewis Bill

With the recommendation that it be amended so as to empower the postmaster general to fix rates, the District Commissioners sent to Congress a favorable report on the Lewis bill providing for government acquisition and operation of the District telephone system.

The commissioners say they approve of the bill, recommend its enactment and give the following reasons for their action:

"The services performed by the telegraph and telephone companies of this country are of a public nature and being so must be monopolistic to be efficient. When for its efficient conduct a public service ought to be a monoply then it should be conducted by the government and not by private interests.

"The telephone is as essentially the performance of a public function as is the carrying of the mail. Tested by any theory of what constitutes a public function the telephone meets the test. To leave to private individuals, as a source of private profit, the performance of such a public function, resting, by necessity, as it does, upon special privileges, and being monopolistic in character is to insure the maintenance of the struggle between public duty and the public needs on the one hand, and private interests and profit on the other, that in the nature of things grow sharper with the passing years.

"The management of a public utility privately owned and operated is chiefly concerned in making the largest dividend returns for its stockholders—that is, private profit. The public is chiefly concerned in securing the best service for the least amount of money—that is, the most efficient public service. If this public service is performed by the authorities they can have no other motive than to do those things that the public demands. They have but to maintain the proper relation between efficient service and the cost thereof.

"The question of the control and operation of the telegraph and telephone systems of the country has in recent years been the subject of much discussion, with its importance constantly increasing. In this country the service is under private ownership, while in nearly every other civilized country in the world government ownership of telegraph and telephone lines is in successful operation. The commissioners favor the postalization of the telegraph and telephone systems of this country, and as a step in that direction they believe the enactment of this measure will demonstrate the efficiency and economy of the telephone under government ownership and operation.

"The control and operation by the Postoffice Department of the telephone system of the District of Columbia is logical and defensible. Here is the seat of government under the exclusive legislative control of Congress. Public ownership of the telephone would insure the complete control of the communications of the government and safeguard its executive and military affairs. The government is the largest user in the District of the telephone, paying, so it is stated, over $100,000 a year for this service.

"The commissioners feel that the conspicuous position of Washington will make a practical demonstration in that city of especial value in shaping public opinion throughout the country on the subject of the complete postalization of the telegraph and telephone service.

"Regarding the structure of the bill, the commissioners suggest that section 7 be amended so as to empower the postmaster general to fix rates. In their opinion, it would be a mistake to have rates fixed by statute."

Dallas Company Wants New Franchise

The Dallas, Texas, Automatic Telephone Company will spend from $1,000,000 to $2,000,000 for improvements and extensions, if the city grants the company a new franchise, as outlined a few days ago in a statement to the City Commission.

Mayor Henry D. Lindsley and other members of the commission discussed the statement at a conference, but no definite action was taken, it was said.

The Automatic company set out in its statement that it sought a new charter, one which would permit it to merge with another telephone company. The company also wants a service at cost franchise.

The following paragraph in the latest statement to the City Commission was referred to by J. C. Casler, president of the company:

"If under such a franchise, with the aid of the city, we can work out the merger, we would do so. If it should prove to be impossible to work out the merger the Dallas Automatic Telephone Company would, nevertheless, be in better position even than before to give the city the best possible service at the lowest possible rates, for it would have the benefit of the close understanding and co-operation with the city, which is inevitable under the closer control of the utilities that the city is now providing for under the city charter."

According to statements made at the city hall, all members of the city commission favor the merger if it can be effected on terms which protect the interests of the Dallas public.

It is said that during the next thirty days a complete check can be made of the two local properties and a proper valuation determined from the standpoint of the city.

Presumably, the city will appoint some disinterested engineer to make a recheck of the valuations submitted by Edmund Land of Detroit, Mich. When the merger was discussed a year or so ago, the name of Dr. E. W. Bemis was suggested as the man to make the check on the part of the city. Whether Dr. Bemis will be retained in the present case is not stated by city officials.

A financial check of the earnings of the two companies will be made by the city before the merger is made effective, so it is stated.

Under present conditions the Southwestern company has no city franchise. It operates under grants and permits and has never been made to take out a franchise in spite of pole and wire tax litigation started under the Holland administration.

Rural Lines Win in Iowa

Nearly 5,000 rural telephone lines won a victory over the electric lines of Iowa when the state railroad commission handed down an opinion holding that if electric lines interfere with the service on telephone lines along the same highway, the cost of changing the telephone lines to metallic circuit systems so as to withstand the interference must be paid by the electric lines.

Had the decision gone against the rural lines, it would have cost them $5,000,000 to change their systems to metallic circuits.

Brevities of the Business

The Activities of the Whole Telephone Field Told in Short Paragraphs

PERSONAL NOTES.

The announcement that Edward K. Hall, vice-president of the New England Telephone and Telegraph Company had resigned from that position and that he had been elected vice-president of the Electric Bond and Share Company of New York city, came as a surprise. Although Mr. Hall has had the New York offer under consideration for some time it was not finally decided until January 3. For some months he will probably give about half-time to each company as it will not be possible for him to drop his work at the telephone company at once.

John J. Carty, chief engineer of the American Telegraph and Telephone Company of Chicago, Illinois, has been commissioned by President Wilson as a major in the signal officers' reserve corps. For his services in the advance of science, the emperor of Japan recently decorated Mr. Carty with the order of the Rising Sun and the Order of Sacred Treasure.

W. F. Hathaway has been appointed manager of the Dubuque office of the Iowa Telephone Company, succeeding C. E. Campbell. Mr. Hathaway was manager of the Anamosa office of the phone company at the time the Iowa guardsmen were called upon for Mexican border service. He was a member of the guards and responded to the call. Although not a member of the Dubuque company, he was transferred to the Greys after arriving at the border and came back home a sergeant.

H. A. Dennis, formerly manager of the Texas Long Distance Telephone Company at Forth Worth, has arrived in Port Arthur to succeed F. L. Middleton as manager of the company's business at this point. Mr. Middleton has been promoted to a position as traveling special agent.

Several changes among the executive officials of the New England Telephone & Telegraph Company were made at a meeting of the directors, all of them being in the nature of promotions. Some were the direct result of the recent resignation of Vice-President E. K. Hall, who has become vice-president of the Electric Bond & Share Company of New York. To fill the vacant vice-presidency, Edmund W. Longley, general auditor, was promoted to that office, and T. E. Moore, auditor, was made general auditor. John Balch was advanced to the office of treasurer from that of assistant treasurer, Vice-President Francis A. Houston, who was also treasurer, retiring, by his own wish, from the treasurership. M. B. Jones, counsel, was made general counsel and F. W. Story was chosen assistant to the president.

John A. Barrett, inventor and electrical engineer, associated for many years with the American Telephone and Telegraph Company, died November 9th at his home in Maplewood, N. J., after a long illness. He was in his fifty-eighth year.

At the request of Secretary of War Baker, Walter S. Gifford, statistician of the American Telephone and Telegraph Company, has been granted a twelve-weeks' leave of absence by the telephone company in order that he may act during that time as director of the Council of National Defense, a government body recently authorized by Congress.

Charles Ezra Scribner, for forty years with the Western Electric Company and its predecessor, and for many years chief engineer of the company, has, at his own request, been relieved of his executive duties and has been appointed to the position of consulting engineer.

Frank Baldwin Jewett has been appointed chief engineer, succeeding Mr. Scribner. Mr. Jewett had been assistant chief engineer.

Walter P. Hoagland, formerly head of the supply sales division of the Western Electric Company, Chicago, has been appointed Assistant Sales Manager at Chicago. Mr. Hoagland started with the Western Electric in 1900 in the retail store at Chicago. He later was placed in charge of the retail store and held this assignment for four years. He was then made city salesman for one year. He continued in various office capacities until May, 1911, when he was made head of the supply sales division.

John H. Gleason has been given the title "manager power apparatus sales," Chicago. Mr. Gleason went with the Western Electric Company in 1903 and has filled about every position in the organization which is in any way connected with power apparatus work. These assignments have included positions in the schedule department, billing department, purchase records, power apparatus output, and power apparatus service.

J. B. Williford was made manager of the Southwestern Telegraph and Telephone Company's office in Sherman, Texas, effective January 1. He succeeds E. M. Rogers, who has been transferred to Amarillo. Mr. Rogers also was commercial agent for the Sherman-Denison district, and this position was taken by C. C. Kirby, of Denison.

The third annual dinner of the employes of the Cincinnati and Suburban Bell Telephone Company was held at the Gibson Hotel in Ohio on December 25. About thirty-five attended. W. Frank Armstrong was the chairman of the committee of arrangements.

J. J. Veatch, who has been district manager for the Central Home Telephone and Telegraph Company at Paris, Kentucky, for the last three years, supervising their property at Maysville, Carlisle and Cynthiana, in addition to Bourbon county, has been promoted to a similar position with same company, including all the towns east of Louisville, including Shelbyville, Eminence, Owenton, Frankfort, Lawrenceburg, Harrodsburg and way stations. Mr. Veatch's office will remain in Paris, where most of his time will be spent.

Newton B. Penny, of Toledo, Ohio, has been appointed manager of the Central Union Telephone Company at Bowling Green, taking the place of Charles J. Rapparlie, killed in an auto accident.

H. Porter Shaffer, of Hagerstown, Pa., has been appointed general superintendent of traffic for the Rio de Janeiro and San Paulo Telephone Company, in Brazil.

J. O. Martin, of the Chesapeake and Potomac Telephone Company, lectured on "The Romance of the Telephone" on December 26 before the Washington branch of the National Association of Engineers, at their hall, 1204 Pennsylvania avenue, Fremont, Ohio.

William Ortgessen, manager of the Peoples Telephone Company at Tallula, Illinois, resigned early in October, 1916, and was relieved January 1, 1917, by Edward Careral of Petersburg.

Leigh S. Keith, of the firm of McMun & Miller, has returned to Chicago, having spent three days at the telephone convention at St. Paul, Minn.

Ralph Cookston, who has been manager of the local office of the Central Union Telephone Company at Mansfield, Ohio, has been promoted to a position in the general offices of the company at Akron. He is succeeded by Morris Starn, who has had charge of the traffic department of the local office for the past few years.

Ira G. Dodd, who began working for the Southwestern Telegraph and Telephone Company twelve years ago as assistant collector in Fort Worth, Texas, later becoming chief collector, following which he was made manager for the company in Arlington, has been appointed manager for the company in Weatherford.

The annual meeting of the Farmers' Mutual Telephone Company at Shellsburg, Iowa, was held on January 20. The resignation of J. A. Viles, who for twelve years has served as treasurer of the company, was accepted. The following officers were chosen: President, J. D. Hagan; vice-president, James Maxson; secretary, Dr. I. S. Boles; treasurer, Henry Kuhn.

Carl M. Dolph, a member of the contract department of the Citizens' Telephone Company of Grand Rapids, Mich., has tendered his resignation to become associated with the Mutual Benefit Life Insurance Company in Grand Rapids. He formerly resided in Detroit.

It is announced that a Mr. Bradley, of Columbus, Ohio, has been named manager of the Bell Telephone Exchange at Alliance, to succeed Manager Walter R. Elson, who resigned some time ago to take up active duties as president of the Malvern Fireclay Company, in which concern he has had an interest for several years.

At the Cleveland Real Estate Board's luncheon at the Colonial Hotel on January 18, Allard Smith, general manager of the Cleveland Telephone Company, spoke on his company's recent survey of Cleveland. Members of the city plan commission were invited.

H. W. Wood, who for the past number of years has been traffic superintendent of the Wheeling, W. Va., division of the Bell Telephone Company, has been promoted to division man-

ager of the traffic department, according to word given out at the local Bell Telephone office.

Russell R. Tower, Baltimore, has been appointed district traffic chief for the division of the Chesapeake and Potomac Telephone Company, at Hagerstown, succeeding H. Porter Shaffer, who resigned to accept a position with a telephone company in Brazil.

NEWS FROM THE FIELD.

ARKANSAS.

The Southwestern Telephone and Telegraph Company has a crew at Gravette to build a new iron circuit from Gravette to the state line of Missouri. There the work will be taken up by the Missouri and Kansas Telephone Company and completed to Neosho, a total distance of about thirty-five miles. The work will require a month.

The Russellville Telephone Company has purchased a site on Torrence street and will erect a two-story brick building. It will install a generating plant and make other improvements.

Forty-five men, representing an investment of millions of dollars in telephone companies in Arkansas, attended the opening session of the third annual meeting of the Arkansas Telephone Association on January 15. The meeting was at the Hotel Marion and was continued through the day.

CALIFORNIA.

The new telephone exchange building to be erected in Hillsborough is to be a most ornate affair with attractive grounds as a feature. The grounds surrounding the structure are to be parked. To make this possible it has been necessary to cut down a number of tall eucalyptus trees. Permission to do this was obtained from the State Highway Commission, notwithstanding that the park commission of Burlingame entered a vigorous protest. It is claimed, however, that the growth of the cities of Burlingame, Hillsborough and San Mateo justify the removal of the trees, and that if improvement is to go on some of the trees must be sacrificed.

At the regular yearly meeting of the Raisin Rural Telephone Company, held January 9, the following officers were elected for the ensuing year: C. E. Burnell, president; J. M. Long, vice-president; C. G. Ross, secretary-treasurer; N. C. Livingston, line manager; S. S. Flickinger, F. B. Storms, N. C. Livingston, J. R. Moore, J. B. Flickinger, directors. With the exception of line manager all the old officers were re-elected.

Claiming that the expense of removing its poles from Cutter avenue from J to M streets, Sacramento, was large, the Pacific Telephone and Telegraph Company notified the city commission that the company preferred not to remove the poles for at least two and a half years. The poles were placed there eight years ago, so the company claims, and they will serve the needs of the company for at least two and a half years more and at the end of that time they will have to be removed because they will have deteriorated and will no longer be safe. Some time ago the residents of Cutter avenue requested the commission to have the poles removed as they detract from the appearance of the avenue. The matter was then taken up with the company and the reply to the commission came on January 11.

The fittings of the new office of the Gilroy Telephone Company are gradually being placed in position and the $4,000 switchboard which was ordered has now arrived and become installed. Toward the middle of February the new offices will be occupied and this will then have the merit of being one of the best equipped offices in the state. The managers of the company are of the best and most experienced business men of this city, and the merit of Charles Schemel, who will have charge of this office and its works, is shown by his skillful management in the past.

COLORADO.

Following an eighteen months' investigation, the State Public Utilities Commission fixed $14,698,414 as the fair value for rate making purposes of the Mountain States Telephone and Telegraph Company. This amount includes the value of the property as determined on the cost to reproduce it, less depreciation and the necessary working value in addition to the going concern value. On this basis the commission found the company is not earning in excess of a reasonable rate of return—which the commission holds to be 8 per cent per annum—but asserts that the company will not be permitted to raise its rates to allow an earning of this per cent.

An oral review of the suit brought by citizens of Denver to test the right of the telephone company to use the city's streets will be heard by the State supreme court sitting en banc, on February 5. The suit was brought by former District Attorney John A. Rush, acting in the name of the people. District Judge John H. Denison ruled that the telephone company did not legally possess a franchise to operate in the city. The case was appealed to the higher tribunal and a review of the case was ordered.

Workmen of the Mountain States Telephone Company are now engaged in numerous repairs and extensions to the wires of the company in Ft. Collins, which, when completed, will represent an investment of $10,000 in new equipment and will furnish work for approximately ten men for about three months.

FLORIDA.

With 355 miles of cable stretched from Jacksonville to Miami and the last lap to Key West under construction, the long distance telephone service of the American Telephone and Telegraph Company that will constitute a joining link with the proposed cable from Cuba, will be completed in about thirty days. Under the supervision of the local office of the Southern Bell Telephone Company this work has been in progress since February, 1916, and approximately $500,000 has been expended. From Jacksonville to Key West the right of way of the Florida East Coast Railway has been followed. When finished, the line will be 522 miles long. Inability to get material has caused some delay on the Key West extension, as part of the cable used is manufactured in England. However, it is believed that the line will be completed in a month.

ILLINOIS.

A new motor generator is being installed at the central office of the Central Union Telephone Company at Beardstown. Heretofore the ringing system has been operated by energy furnished from a series of batteries, but by means of the new motor generator the current from the ringing system will be furnished direct from the wires of the Public Service Company and the entire energy of the battery system will be available for transmission.

What a vast number of instruments and what enormous quantities of material, including receivers and transmitters, switchboards, poles, wire, conduits, brackets and other necessary paraphernalia have been required for telephone service in Chicago alone may be judged from the fact that in 1900 only 30,000 telephones were in use and that the number now is over 448,000. The telephone was invented thirty-eight years ago, since which the extension of wire has been at the rate of one mile for every forty seconds. About 29,000,000 miles of wire are now in use throughout the world. The Bell system alone now comprises 21,000,000 miles of wire connecting 9,000,000 stations.

Material is arriving from day to day for extensive improvements in the plant of the Central Union Telephone Company at Jacksonville, and A. L. Taylor, district manager, states that the work is being pushed as fast as possible. Electric manufacturers the country over are behind with their orders, and though this will serve to delay matters somewhat, the early spring months will see the local plant among the best equipped in this part of Illinois.

A deal was closed between the stockholders of the Luzader-Watkins Telephone Company in Greenwood township, and the Montgomery County Telephone Company, whereby the property of the former was consolidated with that of the latter. A metallic line will be put in, thereby greatly benefiting the service, which of late has been anything but good, on account of the high tension wire running parallel with it. The change is welcomed, at least the promised improvement is.

Chicago's prospects for obtaining home rule over its public utilities will be impaired if, through the City Council, it insists on a forfeiture of the automatic telephone plant. This suggestion was made by R. J. Dunham, vice-president of Armour & Co., and one of the managing directors of the Chicago Tunnel Company, which operates the automatic plant.

Copper wire thieves raided the Central Union toll lines north and east of Buda, clipped half a mile of wire from the poles and crippled the service to Princeton and other adjacent towns. The wire stolen was valued at about $50. Six wires for seven spans were cut, but the thieves got away with only four of them. Once before thieves raided the Ceneral Union lines at Foster's corner, where the gang operated on January 17. What is believed to be the same gang stole a mile and a half of wire from the 'phone lines along the Illinois and Michigan canal, east of La Salle, on January 19.

In compliance with the request of Manager Seymour, arrangements have been made by the officials of the Central Union at Beardstown for the installation of a Western Union Telegraph Company clock. Because of the large number of railroad men in the city, and the frequent demands on the central office for the correct time, the request was made for a clock which can be depended upon at all times to tell the accurate time.

The Piatt County Telephone Company is installing new apparatus in the office, and will soon have as fine a telephone service

as can be had anywhere. A new switchboard which alone cost $6,000 is now being connected, and when completed and in operation will be a great convenience for the patrons of the office.

Birmingham was well represented at the farmers' meeting in Plymouth when the Plymouth Farmers' Switchboard Company was perfected. Thirteen farmers' telephone companies, owning about thirty lines, are interested, and having incorporated under the laws of the state of Illinois, the farmers are now in shape to better their service and be entirely independent of all other telephone companies.

Representatives from nine counties and two states, controlling more than 100,000 telephones, were present on January 13 at one of a series of "get together" luncheons given by the Chicago Telephone Company to its suburban managers, traffic chiefs and chief operators at the Hotel Sherman. The gatherings are for the purpose of recommending changes in the system, made necessary because of the large increase in business during the last year.

Private telephones will connect the pulpit of the Congregational church of Winnetka with all the pews for the accommodation of persons of defective hearing and those in the rear of the house. The arrangement is expected to be permanent. The Rev. Edward F. Snell is the pastor.

In Japan it is the daily practice to sell, buy or pawn the telephone. There are a large number of so-called telephone brokers who deal in telephones, and many of the brokers are doing their business with a large capital, and it is one of the profitable businesses of the country. One's telephone number is a commercial article, and whenever he desires or needs ready cash he can sell it immediately for cash. The easy sounding and ready to remember numbers bring a much higher price than ordinary numbers. Such numbers as 5555, 6000, 500, 1234 and the like could easily be sold for 1,000 yen ($500), and any broker will lend you $300 to $400 on such a number.

The investigation of the books of the Chicago Telephone Company, being made by Comptroller Pike at the order of Mayor Thompson, followed a charge made to the mayor by W. N. Furthman and W. P. Stuart, electric engineers, according to the mayor. "They called on me and charged that the city is not getting the full value of the provisions in the company's franchise that 3 per cent of the gross income shall be paid into the city treasury," the mayor said. "It is charged that the company has been using substitutes for certain construction materials and charging their costs on the books at the value of the best material."

INDIANA.

The county commissioners agreed to permit the Central Union Telephone Company to extend its cable beyond the west end of the county bridge across the river at Terre Haute. The company will install an underground conduit system and will construct manholes in the roadway.

The Pennsylvania bridge across the Ohio river, which is being reconstructed, will not be used longer for telephone cables between Louisville and Jeffersonville and New Albany. The new cable to this city will cross the Big Four bridge, saving 6,000 feet over the Pennsylvania bridge route. The New Albany cable will be laid under the river, saving 10,000 feet.

IOWA.

Council Bluffs telephone operators are to get an increase in pay. Following a request from the girls for higher pay, Manager Frank Elgan announced that he was arranging a schedule which would insure the operators more wages.

The year just closed was an active one for the Iowa Telephone Company, which, having merged the two plants into one prior to 1916, had much of the work necessitated by the change, to do during the past year. To serve the patrons of the two former exchanges and at the same time improve this service and add modern equipment for the handling of the business in the most satisfactory manner, the company had to expend a large amount of money and the sum spent last year reached $75,000.

Plans for the erection of a new telephone exchange in Fort Madison are being made by the Iowa Telephone Company. The land was purchased recently for that purpose and the building will be erected in the near future.

The Traer Mutual Telephone Company re-elected the old board of directors at the annual meeting. John Kober will serve as president. There are 1,887 'phones on all lines and the payroll exceeds $10,000. The total receipts were over $30,000. While the expense of maintenance, taxes and supplies were higher than last year, the net income was also higher, so that company officials consider they had a prosperous year.

The supreme court of Iowa handed down a decision that the telephone and telegraph companies have the legal right to use the public highways in erecting their lines. Telephone and telegraph companies have exercised this right for many years through the franchise. This decision will eliminate the trouble and expense of securing a franchise for the construction of rural lines.

KANSAS.

According to reports, the name of the Missouri-Kansas Telephone Company has been changed to the Southwestern Bell System.

The Peoples Home Telephone Company, through its attorney, A. E. Dempsey, filed a suit in the district court to collect $846.23 from the Lansing Telephone Company. It is alleged that this amount is due on exchange services between the two companies for the years 1915 and 1916. The petition states that the Lansing Telephone Company refuses to make a settlement, on the claims presented. As an exhibit in the case there is a long list of exchange telephone charges set out.

The stockholders of the McPherson Telephone Company met in the office of George W. Allison for the annual meeting. The report of the secretary-treasurer, L. C. Criner, showed that during the year McPherson crossed the one thousand mark in number of patrons. There are now 1,014 subscribers in the city and the increase during the past year was twenty-five. There is in this city a telephone for every fourth man, woman and child, with a few extra residents to spare. The city serves 323 rural patrons, which number has remained the same through the year. The company has completed during the past year metallic lines to Groveland, Inman, Elyria and Moundridge. This completes the list of copper lines for all toll stations.

Possibilities of an increase and enlargement of the office building and central station of the Missouri and Kansas Telephone Company at Topeka are indicated by the fact that the company has consummated the purchase of the four lots adjoining the present building between Eighth and Ninth on Jackson street, on the south.

The Missouri & Kansas Telephone Company plans the purchase of independent plants at Pittsburg and Parsons. Application was filed with the public utilities commission for approval of the sale of the properties to the Bell interests. The Parsons and Pittsburg independent companies own toll lines in Crawford, Cherokee, Labette and Montgomery counties. These will be taken over by the Bell under the transfer plan.

KENTUCKY.

J. J. Veatch, who has been district manager for the Central Home Telephone and Telegraph Company for the last three years, supervising their property at Maysville, Carlisle and Cynthiana, in addition to Bourbon county, has been appointed to a similar position with the same company, including all the towns east of Louisville, including Shelbyville, Eminence, Owenton, Frankfort, Lawrenceburg, Harrodsburg, and way stations.

Carey Home Telephone Company, Lebanon, Ky., capital $6,000. Incorporators: R. Hogue Edelen, George E. Kelly and T. H. Goodwin.

Good Hope Farmers Telephone Company, Level Green, Ky., capital $500. Incorporators: W. M. Hurst, R. H. Brown, and J. T. Hurst.

LOUISIANA.

The telephone switchboard now in course of construction at the Western Electric Company's Hawthorne factory, to be installed in the new building of the Cumberland Telephone and Telegraph Company on Poydras street, New Orleans, will be the last word in switchboard construction, according to E. H. McFall, general manager of the Western Electric Co. Mr. McFall installed the first Western Electric multiple telephone switchboard in the building at Poydras and Carondelet streets thirty-three years ago, just across the street from the present building.

MASSACHUSETTS.

Telephone wires now connect Nantucket with Martha's Vineyard Island, and through it, the mainland of Massachusetts. This has been brought about within recent months by the extension of a submarine telephone cable, the longest underwater one in the United States, across Muskeget Channel. At the same time a new twelve-conductor cable was laid across Vineyard Sound to Martha's Vineyard Island. The latter has the distinction of being one of the heaviest ever employed for transmission purposes. It weighs 10.6 pounds to the foot and is 2.69 inches in diameter, the size and weight being considered necessary on account of the strong tides encountered in the sound. The Nantucket cable carries six conductors and weighs about five pounds to the linear foot.

Edmund W. Longley of Salem, auditor of the New England Telephone & Telegraph Company since 1902, has been appointed vice president of the company, to succeed E. K. Hall, who resigned recently. Mr. Longley has been in the service of the New

England Company since 1881, when he began as a boy in the Salem exchange. He worked his way up in successive steps, until he was appointed auditor of the company on March 24, 1902.

A. J. Moore of Boston introduced a bill in legislature which would require telephone companies to maintain two-party lines so that one subscriber cannot give letter or number of other party on line when passing calls to the operator.

MICHIGAN.

Fifteen electric ear telephones have been installed at the Turner street Nederduitsch reformed church at Grand Rapids so members of the congregation, who are partially deaf, may hear the sermons. Some of the members have not heard a sermon in 15 years. The ear telephone is a transmitter attached to the pulpit, wires running to the pews.

In a recent telephone trade magazine an account appeared, telling that Hastings, Mich., secured full automatic service from the Citizens Telephone Company. This arrangement was made possible by the Business Men's Association of that city petitioning the telephone company to install the system at an increase in rates of fifty per cent. Hastings is the fifth city in the state to secure the automatic service, the other cities being Grand Rapids, Lansing, Battle Creek and Holland.

O. R. Angell of Milan, who is to succeed William H. Sullivan, the local telephone manager, was in Lansing, December 28. Mr. Angell is to be transferred from Milan, where he has acted in the capacity of manager for several years.

To provide more satisfactory telephone facilities between Escanaba and Menominee, announcement has been made that the Michigan State Telephone Company will construct a new toll line between the two cities. An additional copper circuit will be strung from Escanaba to Wallace, together with another circuit from Menominee to Stephenson.

MINNESOTA.

The improved service promised to the city commission of Morris by the Stevens County Telephone Company on January 1, 1917, will not be possible because the new building will not be ready for occupancy before March 1 and possibly as late as April 1. The telephone company are unable to move into their new quarters on East Sixth street because of the inability of the manufacturing companies to obtain raw materials needed in the construction of the company's switchboard.

Minnesota is the home of 1,735 telephone companies, according to the second annual report of the state supervisor of telephones, J. W. Howatt, to the state railroad and warehouse commission. The term "telephone company" include farmers' mutual lines. In the last year, 364 cases were filed with the commission, including complaints and petitions for service.

A reduction of 25 per cent in certain of its long distance rates in Minnesota, was put into effect by the Northwestern Telephone Exchange company, on December 1. In localities where the present rate for twelve miles or less is 20 cents for three minutes, the rate will be reduced to 15 cents. The present charge of 5 cents for each additional minute will remain. No changes will be made in the toll rates for longer distances.

One of the substantial improvements made during the past year is the exchange of the New Ulm Rural Telephone Company. This is located at the intersection of German and Second North streets and is a modern telephone exchange building in every respect. It is almost completed at a cost of approximately $14,000.

Carl O. Field of Owatonna, son of L. P. Field of 320 East Main street, has been appointed state telephone inspector in the telephone department of the Minnesota railroad and warehouse commission. Mr. Field has been employed as facility man for the Northwestern Telephone Exchange Company of Owatonna for the past ten years.

The new telephone line to Merrifield, extending 12 miles from the city, has been opened for service. It was built and is operated by farmers.

MISSOURI.

Proposed increased telephone rates of the Missouri & Kansas Telephone Company at Springfield, Mo., were suspended until July 29, 1917, by the state public service commission, acting on its own initiative. The proposed increase changed the rates on individual lines from $3 to $4.50 per month and on residence from $1.83 to $2.50 a month.

Missouri and Kansas Telephone Company has received authorization from Missouri public utilities commission to purchase Southwestern Telegraph & Telephone Company, Pioneer Telephone & Telegraph Company of Oklahoma, and Southwest Telegraph & Telephone Company of Missouri for $17,500,000.

MONTANA.

A telephone line between Miles City and Ashland, 90 miles, was practically assured after not over half an hour had been spent by the promoters in starting the list of contributions. The conference was held at the First National bank and it was decided that the line was a commercial necessity and that it would be sufficiently of a revenue producer to justify its construction, accordingly the First National subscribed $1,000 outright, Kenneth McLean $100 and then Mr. McLean visited the Commercial State bank and secured a subscription of $500, and G. B. Pope added $750. It is believed the other banks and the merchants will quickly make up the balance needed, the total estimate being $10,000.

The Four Valleys Company has finished its telephone line connecting Glasgow with Baylor, Opheim and Glentana. The wires run a distance of 57 miles. The company experienced many difficulties in doing the work, the final part of which was done during severe snowstorms. All indications point to the success of the new telephone system.

A number of the residents of what is known as the Hart tract, with O. B. Underwood of Onava, met on January 11 at the residence of H. J. Wick and organized what will be known as the Onava Telephone Company. The line as designated will extend as far east as the Hartenby ranch, the property of D. H. Kunkle. The company expects to make arrangements for connection with the Mountain States Telephone and Telegraph Company. The line is to be about 10 miles in length.

NEBRASKA.

Fifteen to sixteen stories high and about 132x92 feet on the ground will be proportions of the telephone building to be constructed at Nineteenth and Douglas streets, Omaha. It will be at first in shape of an L and when the north wing is built across it, facing on Nineteenth street and the alley, it will be U shaped. Nobody estimates what it will cost, but it would not be a wild guess to say three-fourths of a million. The structure will cover all the Douglas street front.

The addition of 3,700 telephones to the Omaha zone during the year placed this city first in the world in the number of telephones in proportion to population. On December 1 the area served by the Greater Omaha exchanges had 43,581 telephones. An average of 250,000 calls are made over telephones in Omaha every day. The Nebraska Telephone Company has 1,400 employes in Omaha and its annual payroll is approximately $1,000,000. During 1917 the company will spend $500,000 in Omaha for underground conduits, extensions of pole lines, installation of new cables and additional equipment for subscribers.

Another farm party line has been added to the Central City exchange, running southwest of town and including nine subscribers, most of whom live on route 1. There had been three lines in this community but they had become so crowded that it was impossible to any longer give the service which the Nebraska Telephone Company demands that its patrons should receive and hence these lines were split up and another made of them.

NEW YORK.

New York Telephone Company has let contract for 16-story exchange on Broad street, from Pearl to Water streets. Building is estimated to cost $1,200,000.

The common council granted permission to the Federal Telephone & Telegraph Company to sell its properties in the city of Batavia to the New York Telephone Company as a part of the plan of merging these two systems. B. J. Stedman, a Batavia attorney, who appeared for the Federal Company, said that about 90 per cent of the telephone users in both companies had been interviewed and of this number 95.2 per cent had signed petitions asking for the merger.

Technically, the Baiting Hollow and Roanoke Telephone Company, which has served its 400 subscribers faithfully and well, it is regarded, for the past twenty years, is no more, for on December 26 the stockholders, in mass meeting assembled, voted to sell out to the New York Telephone Company, and a representative of the latter promptly drew a check for a little more than $26,000 and paid it to the old officers of the local concern.

NORTH DAKOTA.

The Golden West Telephone Company, incorporated at $5,000, has been granted a charter by the secretary of state. It proposes to construct fifty miles of line in Dunn county, radiating out of Dodge.

"The Bell Telephone Company anticipates a marvelous development in North Dakota during the next five years," said Rate Expert James A. Little of the North Dakota railroad commission. "The company is expanding its physical equipment in this state to care for one of the most unprecedented increases in the history of the northwest."

The Sibley Rural Telephone Company, with home offices at McKenzie, and which plans to construct 100 miles of telephone line running from that village into a rich and populous farming

territory, received its charter from the secretary of state last week. The company expects to invest about $7,500 in its physical equipment, and it is capitalized at $10,000. The first board of directors consists of A. Madland, C. W. Malmquist, E. A. Bloomquist, S. R. Day and P. P. Bliss, all of McKenzie.

OHIO.

The Wayne County Telephone Company, known locally as the Farmers' Company, finished the year of 1916 with a financial surplus of $2,000. President Garrett's report at the annual meeting shows that the company is operating 1,664 telephones. The year's expenditures amount to $19,624.64. Of this amount $2,079.26 was paid for interest and $1,195 for taxes.

Attorney Joseph Sagmeister, representing the Cincinnati and Suburban Bell Telephone Company, has prepared an ordinance making it a crime to deposit slugs or spurious coin in an automatic telephone instrument, which he has submitted to Councilman Michael Mullen for submission to Council Tuesday. The ordinance provides a penalty of $50 fine and 30 days' imprisonment in the City Workhouse for each offense.

The Central Union Telephone Company now has under way or ready to be started improvements to its system in Canton and vicinity which will cost $225,000, according to information given to the telephone service investigation committee of council by Manager Norris, which is coupled with information from Manager Graham, of the Ohio State Company, concerning improvements to its system.

The annual meeting of the Winona Central Telephone Company was held on January 9 at which time the directors for the year 1917 were elected and other business transacted. The directors are Joseph Walton, Josiah Brantingham, Frank C. Coppock, Josiah Jenkins and Dillwyn Stratton. This company has proven a success. It was incorporated in 1903 with about 100 subscribers, and has been increasing until at the present time 500 telephones are in use in Winona and vicinity.

An item taken from an old file in Tiffin dated December, 1896, shows that on three days prior to Christmas, 700 calls were recorded, an average of about 235 a day. The business was handled by two regular and one relief operator. At that time there were less than 200 telephones in service. Now there are 2,775 telephones in service in the city of Tiffin and on December 4 the "peg count" shows that there were 19,021 calls and on the following day 19,609.

Business telephone rates of the Ohio State Telephone Company are increased from $4 to $11 a year under a new schedule filed with the state utilities commission. No changes are made in the charge for residence service. The charge for individual business lines is boosted from $40 to $51 a year, and that for two-party business lines from $36 to $40.

OREGON.

At a meeting of the stockholders of the Damascus Telephone Company the following were elected directors: William Brodie, Seth Young and Henry Hoffmeister. It was decided to have the farmers' line from Damascus to Oregon City put into working order again.

PENNSYLVANIA.

Announcement has just been made of changes in organization by the Central District Telephone Company, whereby F. T. Ewing, heretofore division superintendent of traffic at Pittsburgh, is transferred to Philadelphia as supervisor of traffic. Mr. Ewing's new activities will embrace the states of Pennsylvania, Delaware and parts of New Jersey and Ohio.

Joseph L. Shearer, Jr., contractor, will start at once to erect the new $30,000 brick building for the Bell Telephone Company on South Cameron street, near the Mulberry street bridge at Harrisburg. The negotiations between the contractor and the company were closed on January 12. The building will be under the supervision of H. F. Hope, plant superintendent, and will be used to accommodate a number of employes and offices.

E. G. Simons, district manager of the Scranton district for the Bell Telephone Company of Pennsylvania, announced that H. W. Taylor, chief clerk in the Scranton office, has been transferred to Harrisburg as chief clerk of the Harrisburg subdistrict. Mr. Taylor has been in Scranton since August, 1915.

The Public Service Commission of the Commonwealth of Pennsylvania handed down a decree forbidding the construction by the Perry Telephone & Telegraph Company of a line beginning at Bloomfield and thence to the borough of Newport by the State Road and thence to Millerstown in one direction and to Montgomerys Ferry in the other, on the ground that this "territory" is "adequately served" by the Cumberland Valley Telephone Company. This decree, if not reversed or modified, means that this county is sectionalized between two companies and double tolls must be paid by users of telephones in one section to reach the other. In addition to this, the rejection of the proposed line by this company between Bloomfield and Newport, by which they expected to relieve the congestion of the constantly growing business between Newport and the western end of the county, deprives them of granting this relief.

H. Porter Shaffer, for the past three and a half years superintendent of traffic for the Hagerstown division of the C. and P. Telephone Company, has resigned his position and will sail from New York on the steamship Vantan, for Rio de Janeiro, South America, where he will become general superintendent of traffic for the Rio de Janeiro and Sao Paulo Telephone Company of Brazil, S. A. He assumes his new duties on February 1.

A special meeting of city council was held on January 9 when the matter of placing all wires of the Bell Telephone Company underground was discussed with the company representatives. The telephone company is anxious to devise ways and means of placing its wires in conduits, which in the end means a saving in the way of eliminating considerable repair work at all seasons of the year on overhead wires.

WISCONSIN.

Telephone poles belonging to the Wisconsin Telephone Company are being removed from the main streets in all parts of Superior and erected in the alleys or else done away with altogether. The total cost of the work is expected to be $200,000 approximately.

The Tomahawk Light Telephone and Improvement Company has purchased a new switch board.

A carload of cable, two carloads of conduit and an additional switchboard section have been received by the La Crosse Telephone Company for use in extending and improving the service.

Business men and farmers of the section are organizing a rural telephone to extend from Orient over the Hungry hill and Kelly hill country, thus connecting a rich agriculture land that has heretofore never had a line.

WEST VIRGINIA.

The Bell Telephone Company plans extensive improvements in providing for the extension of their conduit system from Twenty-sixth to Forty-third streets, Wheeling, with the abandoning of telephone poles. Underground cables will be laid through the alleys and not through the streets.

The second meeting of the Wheeling Telephone Society was held November 14 and was addressed by J. K. Martin, construction engineer of the Pittsburg plant.

WISCONSIN.

The private office of the Bell Telephone Company in the Bowers building, Delavan, is being remodeled.

Extension of telephone lines to Pibram has been started.

The rates on both local and rural telephones in Stratford have been raised to $1.25 a month, effective November 1.

K. R. Hantzsch of Milwaukee, equipment foreman for the Wisconsin Telephone Company, has started work and repairs on the exchange at Stevens Point. A total of 140 more jacks and signals will be installed for the local lines and two additional toll boards put in, making six in all. The work will be in progress two or three months and will represent an expenditure of about $11,000.

The construction crew of the Wisconsin Telephone Company have completed their labors in Darlington and have left for Columbus, where they will be stationed for some time.

The annual meeting of the Marshfield Rural Telephone Company was held in the city hall. The reports show the past year to have been a prosperous one. The officers elected for the ensuing year were: O. F. Veers, president; Fred Griesbach, vice-president; John H. Brinkman, secretary; H. G. Hambright, treasurer.

Two new circuits will soon be added to the rural telephone facilities tributary to Menomonie, bringing twenty more subscribers into touch with the local Bell exchange. One will be strung from the city for ten miles out on the Hudson road toward Knapp. Another circuit, containing seven subscribers, will be strung north of Cedar Falls toward Colfax. The line from Menomonie Junction to Davis Corners, five miles from the city, is to be rebuilt.

Telephone rates between Stone Lake and Hayward have been cut from 25 cents to 10 cents by the Hayward Telephone Company.

WYOMING.

The Wyoming and Nebraska Telephone Company, which has a capitalization of $500,000 and will operate with headquarters at Chadron, Neb., and Lusk, Wyo., have been incorpooated. The directors of the company are E. M. F. Leflang, A. E. Grantham and Eben D. Warner. They are also the incorporators of the company.